Contractors and Engineers Monthly

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Highlights Of This Issue

- **Defense Construction**
  Work on two major defense construction projects is described in this issue. The first is concerned with the asphalt plant and paving of runways and access road at the new Naval Air Station at Quonset, R.I. The second is the construction of Fort Leonard Wood, southwest of Rolla, Mo., where four contractors operating jointly, with 3,600 pieces of equipment, converted a sea of mud into a complete army camp for 65,000 men in 5½ months.
  See pages 1 and 9.

- **Concreting for Dam**
  Concreting operations at Whitney Point Dam near Binghamton, N.Y., one of the U.S.E.D. flood-control dams in that area, and the aggregate plant which supplied the sand and gravel for drains and the coarse aggregate for the concrete are described in this issue. See page 2.

- **County Road Work**
  A description of Stearns County, Minn., Highway Department activities, including its highway program, its central and district garages, its equipment roster, and its snow-removal activities appears in this issue. See page 2.

- **R. I. Concrete Paving**
  A much needed highway improvement of the West Shore Road through the Town of Warwick, R.I., including extensive drainage work, widening and rebuilding the old pavement with concrete and laying hot-mix parking lanes, was completed this past season. See page 7.

- **Portland, Ore., Improvement**
  The first contracts for the $4,000,000 highway improvement which will take an Oregon state route through the City of Portland along Front Avenue, converting it to a limited-access boulevard, have been awarded and work is now under way on the preliminary projects.
  See page 15.

- **Rolled-Fill Earth Dam**
  Among the features of the $1,546,000 Surry Mountain flood-control dam in New Hampshire was the variety of earth-moving equipment used by the contractor for hauling the five types of fill which went into the embankment.
  See page 17.

IN THIS ISSUE

Wide Asphalt Runways At Naval Air Station

Compact Asphalt Plant Produced 950 Tons of Base In 8-Hour Shift: Worked Full 24 Hours When Needed

✦ ALL asphalt paving at the 1,250-acre Naval Air Station at Quonset, R. I., was carried out in accordance with the designs and under the supervision of the U. S. Navy, Bureau of Yards and Docks, Commander Raymond V. Miller, C.E.C., Officer in Charge of Construction, and was laid by the associated contractors, George A. Fuller Co. and Merritt-Chapman & Scott Corp. of New York City, with E. Walter Hammer as Project Manager. The work consisted of the paving of runways and access roads. To insure continuity of operation, an asphalt plan was set up centrally at the Station and aggregates stockpiled by the producer which also furnished material for the dual concrete batching plants.

Preparing the Aggregate

The aggregates delivered by the producer were stockpiled adjacent to the asphalt plant and then rehandled by a crane with a 36-foot boom and a ¾-yard clamshell bucket to two hoppers equipped with vibrating feeders. One man controlled the operation of the two feeders to maintain the proper proportions of sand and aggregate being delivered to the bucket elevator which raised the material to a chute delivering it to the drier. The 5-foot diameter drier was 25 feet long and equipped with two oil torches at the outlet end to provide the heat for removing all moisture from the aggregate. Dust from the drier was taken off into a cyclone dust collector and delivered back into the hot elevator as fines for the batches.

The hot elevator took the discharge from the drier and raised it to a 3-deck 4 x 12-foot vibrating screen which separated the material into sand, ⅜ to ½-inch material, and 1¼-inch stone. Power for the electric motors driving the vibrating screens and the vibrating feeders was provided by a generator driven by a 46-30 diesel engine. A D13,000 engine rotated the drier and another was used to drive the pugmill.

Asphalt Binder

Liquid asphalt was delivered to the

(*Concluded on page 20*)

Gravel Foundations of Dredged Material Speeded Paving With Spreaders Working Between Forms

✦ THE wide access road from U. S. 1 in to the gates of the Naval Air Station at Quonset, R. I., was completed with unusual speed. This paving was done in a continuous 83-hour run during which time the base course was laid and rolled ready for immediate service. Careful design of the roadway as well as the proportions of the asphalt hot-mix characterized the work of the Navy Civil Engineer Corps organization throughout. Similar care and speed went into the construction of the vast runways.

Runway Construction

Asphaltic-concrete construction was chosen for the runways at Quonset because of the speed possible in laying them on the adequate strong base of sand and gravel dredged from the Bay nearby. Most of the runways are on this type of fill, only a very small part

(*Concluded on page 21*)

DIRT MOVING IN DEFENSE CONSTRUCTION

Ferguson-Oman Co. of Milan, Tenn., pushed this cut to speedy completion to permit the railroad to be brought into the new Wolf Creek Ordnance Plant at Milan.

Concrete Operations At Whitney Point Dam

Preparation of Rock with Ties and Screeding Ribs; Forms and Concreting of The 60-Foot Control House

✦ THE concreting operations at Whitney Point Dam, some 20 miles north of Binghamton, N.Y., one of five such projects designed to prevent further disastrous floods in the Upper Susquehanna River watershed, offer interesting material for study as regards the methods employed.

Preparation of Spillway

The spillway is cut in rock in the east abutment of the dam and consists of a curved channel approach to a weir spillway which narrows at the lower end and discharges into a stilling basin and thence through an open channel to the river. The spillway has a crest length of 220 feet and is designed to discharge 75,000 cubic feet per second when the head is 21 feet. To remove the rock in the spillway section, line drilling was done, using Timken 2⅜-inch-gage detachable bits on 12-foot steel driven by a Cleveland wagon drill mounted on Goodyear tires. These holes were spaced with a 1½-inch web between for broaching out the hard blue shale-sandstone. This material permitted the drilling of only two 4-foot 3-inch holes per bit before regrinding was necessary. The first-line break-up holes were 12 inches in front of the broaching holes and 4 feet on centers. The second line of break-up holes was 4 feet in front of the first line, spaced 4 feet on centers, but staggered with the first line. The holes were shot with 30 per cent Hercules dynamite, using power from the electric line.

In the sloping spillway section two Sullivan wagon drills were used to drill 4-inch holes 6 feet deep for the 1-inch hooked round deformed anchor bars for the spillway concrete. These bars were grouted into the holes to provide adequate bonding of the spillway apron with the rock. All connections for the wagon drills were made with Boss air-hose connectors.

The Screed Ribs

A novelty in spillway construction which increased the efficiency of the method of concreting used was devised. The spillway proper is 200 feet wide and in this width the contractor poured six ribs running from top to bottom of the spillway and from 3 to 6 feet wide. These were poured carefully to grade and acted as templates or guides for the screeding of the 30-foot wide x 28-foot long, average dimensions, monoliths bonded to the rock with the tie bars mentioned and varying from 3 to 4 feet

C. & E. M. Photo
Line drilling in the spillway section at Whitney Point Dam, N.Y.

thick, and in one or two cases of overbreakage of the rock as much as 10 feet thick.

Pouring Spillway Concrete

The concrete for the spillway was

(*Concluded on page* 11)

Assembled Plant Furnished Sand and Gravel for Drains During First Year; Concrete Aggregate During Second

✦ THE sand and gravel screening, crushing and washing plant set up at the site of the Whitney Point flood control dam about 20 miles north of Binghamton, N. Y., had a dual role. While local sand is unsatisfactory for structural concrete, the plant turned out over 170,000 cubic yards of sand and gravel for drains in the rolled-earth embankment dam during the first year of operation. Then, with the addition of a pair of crushers and a scrubber, the plant produced all coarse aggregate used for concrete structures the second year. Boonville, N. Y., sand, the nearest sand meeting all tests, was imported 150 miles for the concrete.

Feeding the Plant

Average operation of this sand and gravel plant produced 100 cubic yards of material per hour while it has produced 1,000 yards on an 8-hour shift. Contrary to the usual method of delivering pit material to such a plant, the contractor used a 12-yard LeTourneau Carryall scraper operating in the pit and dumping over a grizzly of inverted railroad rails with a 6-inch opening. All oversize material was tossed into a chute leading to a crawler wagon below and used elsewhere where stone of this size was specified. Material passing the grizzly went into a hopper from which an 8-foot Universal belt feeder delivered the material past a weighted gate on to a 24-inch belt 150 feet long between centers, driven by a 24-hp General Electric induction motor.

Washing the Aggregate

This main belt delivered all of the aggregate to a cylinder screen 22 feet long and 5 feet in diameter with a 7-foot diameter sand jacket extending 15 feet along the main screen. This entire unit was driven by a 30-hp General Electric induction motor which also operated the Universal sand scrubber and classifier. In passing through the cylindrical screen, the material was thoroughly washed by a heavy spray from a central pipe and also by two lateral sprays outside the sand jacket. Water was supplied by a 1,500-gpm Gould 6-inch centrifugal pump driven by a 75-hp G-E motor and discharging through an 8-inch line to the plant.

Crushing and Screening

No crushers were installed in the plant during the first year of operation but for the second year two jaw crushers were installed, a 36 x 15 Farrel Bacon crusher driven by a 100-hp G-E synchronous motor and a 24 x 13 Farrel Bacon jaw crusher driven by a 75-hp synchronous motor.

During the second year of operation

(*Concluded on page* 10)

County Highway Activities

Stearns County, Minnesota, Started 1941 with Program Of Central and District Garage Construction

✦ IN boom times an independent motor car company started the manufacture of automobiles in St. Cloud, Minn., and after a very short life failed, leaving numerous large buildings in the industrial section. These have now been rehabilitated, one being a cooperative incubator building for small industries, another a highway contractor's office, and two others were acquired by Stearns County for a central repair garage and a storage shed. The latter is still in rather dilapidated condition but it does provide a roof over a wide area for the storage of large equipment. The other building has been completely reconstructed since January, 1941, and is an up-to-date service and storage garage.

The New Garages

January 1, 1941, saw the start of a program to provide an adequate repair garage and storage garages for Stearns County and the first, a repair garage and

C. & E. M. Photo
Drilling holes for anchor bolts for spillway concrete at Whitney Point Dam.

C. & E. M. Photo
Overhauling a pump engine in the St. Cloud, Minn., repair shop of Stearns County Highway Department.

shop, was completed and fully equipped in St. Cloud, the county seat, at a cost of $15,000. The County advertised for bids in July, 1941, for three district garages of reinforced-concrete construction, 40 x 80 feet in plan with three overhead doors, designed mainly for storage but with sufficient facilities to handle minor adjustments, while heavier repairs will be sent to St. Cloud.

The St. Cloud garage measures 140 x 66 feet and was rebuilt with WPA labor. A number of the original large steel sashes were replaced with brick panels, and two overhead doors were installed, one at the front and the other at the back of the garage. In a small lean-to at the back of the garage is a Deming Co. domestic water system drawing from a well driven adjacent to the garage. The building is heated from a boiler room equipped with a large Bros boiler and stoker by means of steam radiators, and ventilation is provided by both plenum and vacuum fans. The latter draws air about 18 inches from the floor adjacent to the front overhead door where a large amount of cold air is liable to enter during winter weather.

(*Concluded on page* 38)

Roads and Snow Removal In Stearns County; Well Equipped to Handle All Maintenance Problems

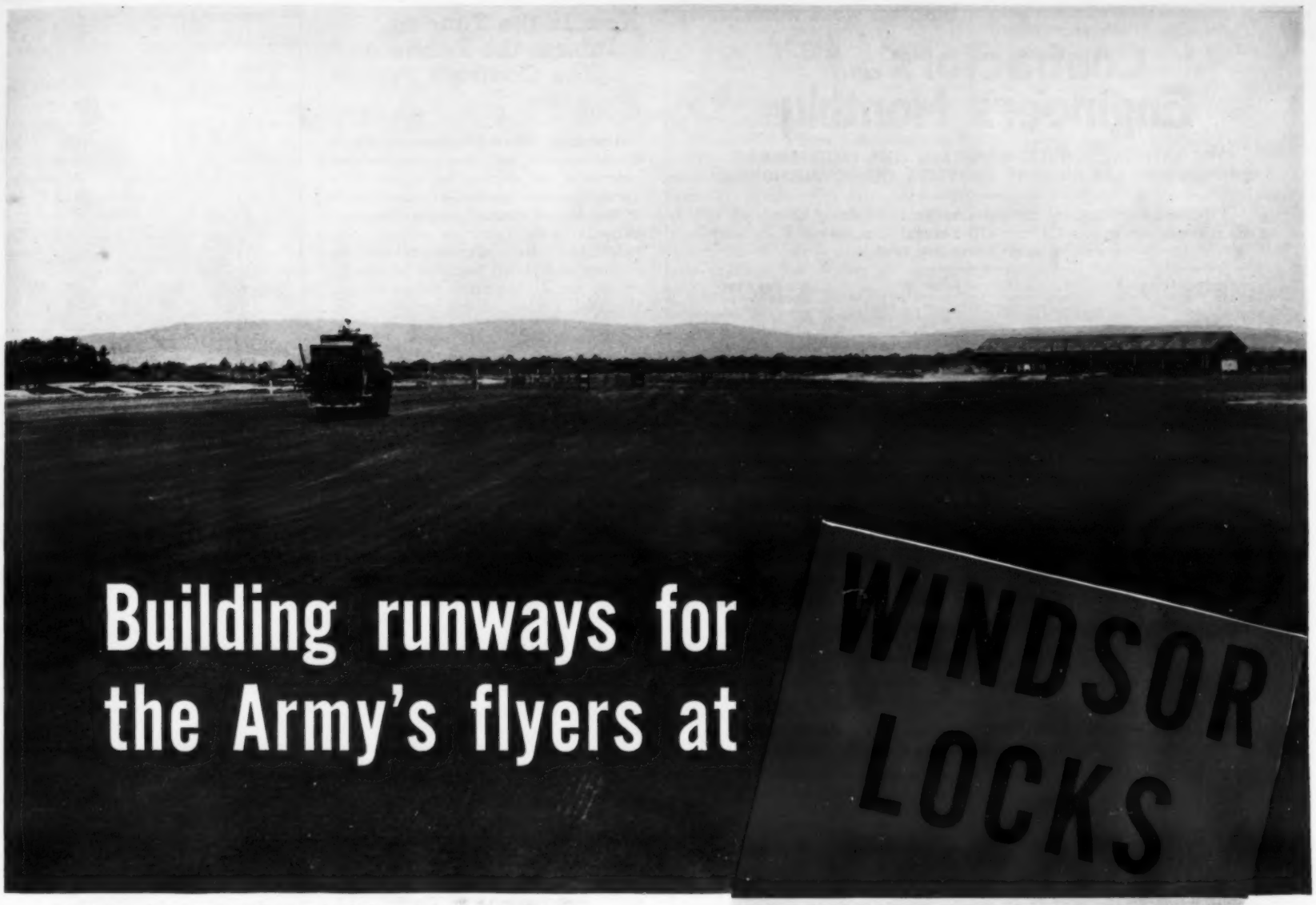
(*Photos on page* 44)

✦ THE county highway mileage in Stearns County, Minnesota, is 749.65 miles, distributed rather uniformly throughout the 1,400 square miles of the county. Of this road mileage, 725 miles are graveled, of which 100 miles have been stabilized with gravel and clay. Of this 100 miles, about 25 miles have been stabilized in addition with calcium chloride, the initial application being 6 tons per mile for a width of 20 feet, and the second application 2 tons per mile 16 feet wide. There are 10 miles of bituminous surfacing or road mix, no concrete, and approximately 25 miles of dirt road which are unimproved.

The county is well equipped for snow removal with two Snogo rotary plows mounted on International trucks with Coleman all-wheel drive. In addition

(*Concluded on page* 39)

A Stearns County highway immediately following the heavy snowstorm of March 17, 1941.



Resilient, skid-resistant Texaco Asphalt surfaces are ideally suited for runways of military and civilian flying fields.

500,000 SQ. YDS. of resilient, skid-resistant TEXACO ASPHALT

When Army flyers nose down for a landing at the new Air Base in Windsor Locks, Conn., three 5,000-foot by 300-foot Texaco Asphalt runways wait to receive them.

These runways are of the hot plant-mixed type, laid in two courses to a combined thickness of 2½ inches. Supporting the Texaco surface is a 4½-inch crushed stone base.

Windsor Locks' resilient, skid-resistant Texaco-paved runways can be depended upon to get Army fighters into the air and receive them from the air with maximum speed and safety.

For military, as well as civilian flying fields, Texaco Asphaltic products make available a variety of runway types. One of these types will fit perfectly the needs of every airport. Experienced Texaco engineers are at your service, when it comes to the selection of the most suitable type of runway for your airport project.

Laying and rolling a 2½-inch Texaco Asphalt wearing surface on 500,000 sq. yds. of runways for the Army's Air Base at Windsor Locks, Conn. Contractors: John McCourt Company and John P. Condon Corp., Boston.

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Chicago Philadelphia Houston Boston Richmond Jacksonville

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What Do You Mean—"Low Cost"?

By BEN H. PETTY,
Professor of Highway Engineering,
Purdue University

The expression "low-cost" has taken a terrific beating in the field of highway engineering during recent years. Obviously it is rather difficult to place an actual limit in dollars and cents below which the cost of a road surfacing must fall in order to be classified as a low-cost road. However, it is equally obvious that when the expenditure for a so-called low-cost road approaches closely to that of a high-type pavement the expression becomes meaningless.

Not so long ago, I had the opportunity of observing the methods of construction on what was originally planned as a low-cost road but which turned out to be a rather high-cost road, for some very obvious reasons. The plans and specifications called for a 6-inch x 20-foot soil-aggregate plant mix, including calcium chloride, to be topped after proper curing with a 1½ to 2-inch plant-mix bituminous wearing surface. The specifications were quite rigid, requiring the subgrade to be finished to within ¼ inch of actual grade which forced the contractor to install steel side forms on which a subgrade finisher was operated, precisely as would be done on a high-type concrete pavement. I maintain that a limiting variation of as much as 1 inch in this subgrade, which could have been met with ordinary grader equipment, would have been satisfactory, so long as a minimum thickness of 6 inches was secured in the stabilized base.

Very tight gradation specifications were written and rigidly enforced, thus requiring frequent stoppages in the contractor's proportioning and mixing operations and forcing him to open up additional borrow pits to comply with the narrow ranges specified. The cost of this finished base was approximately $12,000 a mile and, with the added bituminous surface, the final cost from subgrade to wearing surface was approximately $15,000 a mile.

This approaches closely to the cost of a standard concrete pavement and is equal to or greater than costs of complete high-type pentration macadam pavements as reported by some states.

If properly constructed, a road built under the above specifications should be a good road but obviously it is rather ridiculous to call it a low-cost road. Also, it is questionable as to whether or not it is economically justified in view of the fact that it approaches so closely to the cost of a high-type pavement.

Our guess is that in too many cases the plans and specifications for these low-cost roads are prepared by engineers who have been steeped for long periods of time in purely high-type road design and therefore are loath to loosen up on their standards to permit the use of less rigidly specified materials and substandard methods of construction.

In my twenty years of hobnobbing with county and state road men, not only in Indiana but also in many other states, I have frequently been amazed at the successes attained through the daring use of what some experts would classify as very inferior materials and by adaptation of more unorthodox methods of construction.

No one person or group has a corner on road-building knowledge, and all of us can learn from the other fellow who through the necessity of using local materials has, by the exercise of courage, ingenuity, and ordinary horse-sense, been able to stretch his meager road budget to the limit and produce for the community which he serves a system of roads adequate for the traffic needs.

Because of the great variations in climate, local materials, traffic, etc., no rigid specifications for low-cost roads can be set up which will apply with equal force and effect in our various states and counties. Since road funds are limited, and in many counties and states the annual budget has remained practically the same over a period of several years, in the face of both increased mileage and increased traffic, it is the height of good engineering judgment to make use of local material wherever the expenditure of the needed funds can be justified by the results obtained.

I take off my hat to the thousands of road men, both state and local, scattered throughout these United States who are building low-cost roads actually at low cost but, where the traffic and other conditions demand, are building the high-type pavements under the rigid specifications necessary to secure really high-type results.

Now Is the Time to Inform the Public on The Contract System

Managing Editor
CONTRACTORS AND ENGINEERS MONTHLY

Upon my return from my vacation I found awaiting me your letter and the reprint of the article "Selling the Public the Contract System" which appeared in the August issue of your good publication.

Little by little, contractors all over the country and in all branches of the industry are waking up to the realization that their neglect of this important element, public relations, is largely responsible for the public apathy in the matter of the Federal Government and various governmental subdivisions encroaching on the construction industry. Of course we are interested and we should very much appreciate it if you will please send us twenty-five copies for distribution to our active members.

I find it particularly difficult at this time to kindle enthusiasm for a sorely needed public relations program because nearly all contractors have all the work they can handle and it looks like all "beer and skittles" for some time to come. Indeed, in many instances, even advertised jobs go by the board without bids being submitted. It is of course the height of shortsightedness to permit a long-range business policy to be influenced or determined by temporary factors on a from-day-to-day basis. We know definitely that this boom prosperity is going to dry up before long and we believe that this is a most opportune time to dig in and build up good will for the lean years to come.

The general contractors' arch enemy WPA is not relenting its vigorous campaign to justify itself before the public even at this time when most of us sincerely believe that there is no earthly basis for its continuance. On the contrary, they are making capital of the defense activity, claiming they are particularly well endowed to perform certain phases of defense construction, such as airports and access roads. Only last night I listened to a radio program over Station KEMB, San Diego, extolling the virtues of WPA and telling the public how lucky the United States is to have such far-sighted leaders who created WPA in a period of emergency when it wasn't really needed just so that the country might have it now when it is indispensable. WPA's initials, they say, now stand for "We Prepare America" because "without us the defense program would bog down completely. What good are thousands of airplanes without airports? And WPA is especially well suited by experience and personnel to construct airports and access roads. We have been training men for years looking to just such an emergency as this and we have already completed so many airports and so many miles of access roads and we now have under construction thus and so." In between this insidious propaganda the Marine Corps band plays a few numbers.

"Sorry to interrupt you, Senator, but we're ready to get to work!"

On checking this up, I was informed that this station has allotted 15 minutes three times a week and that the entire program is transcribed, distributed and sponsored by the Federal Works Administration in Washington.

Here then is an excellent example of a fine public relations campaign plus unmitigated gall. Their job to sell themselves to the public should be ten times as hard as that of contractors because they are more expensive, the quality of their goods is poorer, their delivery is slower, and finally their raison d'etre no longer exists.

Contractors, on the other hand, now have the opportunity of a lifetime to "point with pride" and to shout their virtues from the housetops. And do they? They do not! Only a very few industry-minded contractors really care and they see the handwriting on the wall. But their pleas for a vigorous local and nation-wide public relations campaign generally fall on deaf ears. The rank and file of contractors are too busy making hay.

However, while under ordinary circumstances most of them would not bother with such trifles as the future welfare of the industry, more and more are coming to realize that unless they adopt effective measures immediately they will eventually be supplanted by public agencies.

We commend you for your fine contribution to the development of this campaign for the preservation of the contract system.

Sincerely yours,
M. A. Mathias, Manager,
San Diego Chapter, A. G. C.

The First Turnpike

The first Pennsylvania turnpike was built in 1793 between Philadelphia and Lancaster and was known as the Lancaster Turnpike. The first macadam road in the U. S., this 62-mile road was built at a cost of $465,000, all provided by private investors, or about $7,500 a mile.

Keep Construction Going Despite Winter Weather

This coming winter will probably see more winter construction than ever before, because work on vital defense construction projects must continue, regardless of ice and snow and freezing temperatures. This means that thought should be given now to securing the necessary equipment.

A new catalog, No. 234E, describing the Aeroil line of water heaters, salamanders, concrete heaters and other accessories for winter work has just been issued by the Aeroil Burner Co., Inc., 5775 Park Avenue, West New York, N. J., copies of which may be secured direct from that company.

Aeroil reports that it is now filling orders for hundreds of salamanders where formerly it shipped one to a dozen. An order for 500 salamanders has recently been filled for use in the construction of an ordnance plant, and Aeroil water heaters, concrete heaters and salamanders are already on their way for use on construction contracts in Newfoundland, Greenland, and Alaska.

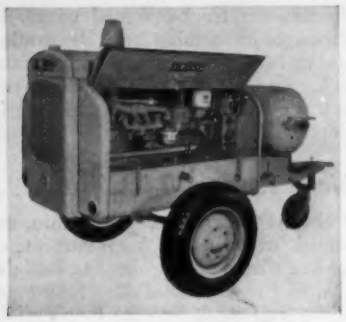
New Snow Plow Catalog

Catalog L on the 1942 line of Ross Burch-Built snow plows has recently been issued by the Burch Corp., Crestline, Ohio, and copies may be secured by interested state and county highway engineers direct from that company.

The Ross line of plows include five models of one-way plows, five V-type models, three new trip moldboard models, two reversible trip blade models and two of the non-reversible type, wings for mounting on trucks, tractors and graders, and frame and body attachments for truck-mounted wings. In addition to describing and illustrating these various snow-plow models, Catalog L also contains information on Burch sanders and spreaders for use in ice control.

New Hobart Distributor

Hobart Brothers Co., Troy, Ohio, announced recently the appointment of John L. Foley, 313 Herman St., Buffalo, N. Y., as its distributor for Hobart arc welders and supplies in the Buffalo territory.



The new LeRoi compressor.

Speed Is Feature of New Air Compressor

Features of the new 60-cubic foot portable air compressor recently announced by the LeRoi Co., 1706 So. 68th St., Milwaukee, Wis., include speed, light weight, portability, and practical design, according to the manufacturer.

Split-second starting is provided through the use of its own electric starting system. A modern sheet-metal steel housing affords protection against the weather, and a two-pneumatic-tired wheel mounting provides ready portability. Included as standard equipment on this 2-cylinder single-stage machine are a 7-cubic foot air receiver, retractable caster-wheel support, double-acting towing eye, complete electric starting system, hinged hood sides, pneumatic tires, spring-mounted chassis, 4-inch front and rear reflectors, and large oil, gas and water capacities.

Internal features include force-feed lubrication, circular-plate-type compressor valves, unit construction with one crankshaft serving both engine and compressor, a rigid connection between engine and compressor, valve-in-head engine, oil-bath air cleaners, drop-forged connecting rods, steel-backed babbitt-lined precision bearings, and wet sleeve engine cylinders. Power is furnished by a LeRoi engine. By utilizing a single crankshaft, the manufacturer states that proper coordination between the power strokes of the engine and the compression strokes of the compressor is provided. The rigid connection prevents the occurrence of any misalignment between the engine and the compressor.

Further information on this new LeRoi compressor is contained in Bulletin 21G-1, copies of which may be secured direct from the manufacturer by referring to this item.

Roebling Celebrates Hundredth Anniversary

Last month the John A. Roebling's Sons Co., Trenton, N. J., manufacturer of wire rope and cable, celebrated its hundredth anniversary. Founded by John A. Roebling, a young German engineer who had immigrated to this country in 1831 and secured employment as an engineer with the State of Pennsylvania, this company's first job was the production of wire rope to replace the hempen hawsers used for tow rope on the Pennsylvania Canal.

Soon other opportunities were presented, also by the Canal, because of the necessity to carry the canal across rivers by means of aqueducts. Roebling claimed that he could build an efficient and inexpensive suspension aqueduct across the Allegheny River, and fulfilled his promise. Three years later he built the wire rope suspension bridge across the Monongahela at Pittsburgh and then, in 1850, a suspension bridge across the gorge of the Niagara River at Buffalo.

This was followed by rapidly expanding markets. In the meantime John Roebling's sons had gone into the firm, both contributing much to its development. During the Civil War, Washington A. Roebling served as a military engineer for the Union army and was responsible for the erection of several strategic suspension bridges, for which he used wire rope from his father's factory at Trenton.

The achievement which was to bring to John A. Roebling and his sons world-wide distinction was the construction of the Brooklyn Bridge. This job cost John A. Roebling his life and the health of his son, Col. Washington A. Roebling, but the bridge was completed as a monument to the engineering genius of the Roeblings.

Today the company has 6,200 employees, with the management still in the hands of the Roebling family. Also carrying on a Roebling tradition, much of the company's production today is for national defense, just as the company served this country in the Civil and Spanish-American Wars and in World War I, for wire rope and cable serve many war-time needs just as they serve the construction, mining, transportation and industrial fields in peace time.

New Catalog on Jacks For All Lifting Jobs

The Buda Co., Harvey, Ill., has recently issued a new pocket catalog on its complete line of lifting jacks, of which there are over 170 individual models now in production. These include such types as standard speed jacks, self lowering, journal, ratchet, automatic lowering, hydraulic, including variable speed and standard, screw types, and others. Each type is illustrated and described, and there is a table designed to help in the selection of the correct jack for any specific job.

Copies of this catalog, No. 1066, may be obtained by writing direct to the manufacturer and mentioning this item.

New Wide Concrete For West Shore Road

Loop Highway in Town Of Warwick, R. I., Widened And Hot-Mix Parking Lanes Laid by M. A. Gammino

(*Photos on page 44*)

✦ A much needed improvement of the West Shore Road, running through Conimicut in the Town of Warwick, R. I., was completed in August, 1941, by M. A. Gammino Construction Co. of Providence, R. I. The contract was awarded in August, 1940, and the extensive drainage completed between Labor Day and December 1. The old macadam was torn up and replaced with new pavement for the entire 2.25 miles, starting the last week of March, 1941, and concrete was completed May 21, with the hot-mix parking lanes and the precast concrete curb following rapidly thereafter. Immediately following the completion of the paving, the entire paving outfit moved to a new dual-highway section of U. S. 1 in the Town of Charlestown, R.I., where the Ocean Scenic Highway runs quite close to the shore of the Atlantic Ocean.

The new construction in Warwick included over 2 miles of storm drains, two 11-foot lanes of reinforced concrete 8 inches uniform thickness, flanked on each side by a 9-foot parking lane of hot-mix asphalt paving, outside of which is the precast concrete curb.

Preliminary Work

A high water table, frequently less than 3 feet below the surface of the ground, and bad sand conditions, "second cousin" only to quick sand, characterizes the terrain. In the preliminary work in 1940, over 1 mile of trench from 4 to 14 feet below grade was excavated and sheeted the entire length for the 12 to 24-inch concrete pipe installed to take care of storm water. The trench was excavated with a Northwest ¾-yard trench hoe.

Also preliminary to paving, the Warwick Water Department disconnected an old 2-inch and an old 4-inch galvanized-iron water-supply line which ran for about ½ mile under this road. The lines were cut out but not removed, and all of the houses connected to the older lines were connected to a newer 16-inch cast-iron line running the entire length of the east side of the road. It was also necessary to lower about 2,000 feet of this 16-inch line which was installed with Leadite joints for distances from 6 inches to 3 feet. Only a few minor leaks showed at any of the joints immediately after the moving and these all set up very quickly.

The grading operation, preparatory to paving, required the removal of an excessive crown in the old road which had made driving dangerous during wet weather. The macadam was broken up with the scarifier of a Buffalo-Springfield 12-ton power roller and then the excess material removed by a Euclid scraper pulled by a wheel tractor and pushed during loading by a Caterpillar D8. Two Marion 1½-yard power shovels were also used in the grading operation. There was little change of grade except the removal of the high crown.

Fine Grade and Forms

Following the rough grading, a Caterpillar No. 12 power grader was used to prepare the subgrade for the fine grading operations and form setting. One boss form setter with three laborers set the Blaw-Knox 8-inch forms well ahead of the paver, and they were followed closely by three men with the first scratch-board to check the grade. Immediately behind them came a 12-ton Buffalo-Springfield 3-wheel roller to compact the subgrade thoroughly and then one man behind the roller gave the grade a final checking with another scratch-board.

The man who oiled the forms was unusually busy, for after "white washing" the forms with oil and a large brush he took care of having the ramps between the section being poured and the concrete previously poured moved ahead so that the batch trucks could back down off the first slab poured into the space between the slab and the outside form. He was also responsible for cleaning up any material loosened by the batch trucks so that the concrete was poured on a smooth uniform subgrade. The forms were protected on the outside with earth pushed up against them by the power grader so that there was never any trouble with concrete, which might be pushed over the top of the forms, sticking to them.

C. & E. M. Photo
The Blaw-Knox concrete spreader shapes up the top course on the West Shore Road through Conimicut, R. I.

New Paving Outfit

The Warwick job was used by Gammino to tune up three new pieces of paving equipment purchased for 1941 paving operations. These included a new 34-E Ransome paver, a Blaw-Knox spreader and a Blaw-Knox finishing machine with hydraulic lift for the screeds. These three pieces of equipment were

(*Continued on page 18*)

A Marmon-Herrington all-wheel-drive converted Ford with V plow keeps a road open for traffic.

Efficient Equipment Lessens Snow Problem

To sit around a "pot-bellied" stove on cold winter evenings and listen to the old timers talk about the terrific snow storms of their boyhood, one would believe that Mother Nature had taken pity on a sorely beset world and eased up on the rigors of winter.

But the records prove that such is not the case, according to the Marmon-Herrington Co., Indianapolis, Ind., manufacturer of all-wheel-drive trucks for snow-removal service. And road maintenance officials, who are now getting their equipment ready to meet the snow problems of the coming winter, know that the snows are coming again this winter as usual and that, because of the defense program, prompt snow plowing is particularly vital. They know too that because of the defense program, it will take more time this year than ever before to obtain the necessary equipment.

The fact that thousands of miles of highways are now open for all-year-round traffic while only a comparatively few years ago they were impassable for weeks and months at a time is due not to any lessening in the amount of snow but rather because highway engineers have learned how to prevent drifts from forming in many cases and also how to use modern snow-plowing equipment most effectively.

In 1934, the Marmon-Herrington Co. began the conversion of standard Ford trucks to all wheel drive, and these less expensive, speedier and easily maneuverable units became popular for snow removal. All manufacturers of standard snow plows, both V-type and rotary, made adaptations of their equipment for use with these lighter trucks. With these Marmon-Herrington converted Fords, snow-removal crews can get out on the roads at the first snow fall, and because of their speed they can keep up with the fall of snow, providing the wind is not too severe. In locations where it blows when it snows and it is therefore necessary to wait until the storm has abated, the Marmon-Herrington heavy-duty all-wheel-drive units offer the power and stamina to handle heavy drifts. With the snow removal job over in the spring, these same units may be used for general hauling, grading, road building, and general maintenance activities during the remainder of the year.

Much of the Marmon-Herrington's greatly expanded output is now being utilized for production of vehicles for defense, but company officials state that a strenuous effort is being made at the same time to supply vehicles for such vital services to the defense effort as the construction and maintenance of the nation's highways. It must be remembered, however, that more time is now required for deliveries, and highway engineers interested in Marmon-Herrington units for snow removal service this winter should get in touch with the company at once.

Buy Defense Bonds and Stamps.

Synthetic Finishes For Machinery Use

Machinery finishes must resist many conditions which cause paints and enamels to deteriorate. Contact with oil, grease and other solvents; temperature variations from cold to intense heat; and abrasion all tend to shorten the life of these finishes. In certain services, frequent spillage and constant hosing down cause failure of the paint film, with consequent attacking of the metal by acids, alkalies and moisture. A new synthetic resin-base machinery finish has been announced by E. I. du Pont de Nemours & Co., Inc., Wilmington, Dela., which is said to possess greater durability than oil or varnish-type enamels and to be relatively unaffected by contact with petroleum oils or grease and only slightly affected by highly volatile thinners. Dark-colored machinery finishes of this type are said to retain their life and good looks despite intense heat. Further, the flexibility of the finish renders it resistant to knocks and minimizes cracking or chipping.

In the use of these synthetic resin-base finishes, grease, oil, rust, or deposits of any kind should be removed from the metal before applying the finish. The surfaces must be washed with turpentine and the finish brushed or sprayed on. One or more coats, depending on the quality of finish desired and the system employed, are required.

New Texas District Engr. For The Asphalt Institute

The announcement of the appointment of E. B. Cape as District Engineer for the territory comprising Texas, Oklahoma and Arkansas has been made by The Asphalt Institute. Mr. Cape, who will make his headquarters in the Littlefield Building, Austin, Texas, has been associated with the Texas Highway Department for the past twelve years as Assistant Resident and Project Engineer, then as Assistant Construction Engineer and most recently as Materials and Test Engineer.

Fort Leonard Wood, A Construction Epic

Four Contractors and 3,600 Machines Speeded Work at New Army Camp In Central Missouri

By FLOYD SUTER BIXBY

(*Photo on page 44*)

✦ DEEP in the Missouri Ozarks, 33 miles southwest of Rolla in Mark Train National Forest, is Fort Leonard Wood. The story of its recent construction by four Iowa contractors working under Quartermaster Corps direction is a legend of engineering achievement under adverse natural difficulties. In the brief span of 5½ months this monstrous job was pushed to completion on schedule.

In that 5½-month period the 7 square miles of camp site were graded and crisscrossed with roads, 34 miles of high-tension power transmission line was built to carry electricity in to the camp, a 65,000-man sewage disposal plant was built, a huge pumping plant was set up, and 1,537 permanent buildings and 250 temporary ones were erected. Then, when winter rains and mud were at peak stage, an order came through to build a 27-mile railroad spur from the camp to the main railroad. That meant that 1,500,000 cubic yards of solid limestone had to be drilled, blasted and hauled to fills or disposal areas before rails and ballast could be placed.

The job had originally been scheduled for Iowa, and a cost-plus-a-fixed-fee contract was let to W. A. Klinger, Arthur H. Neumann & Brothers, Western Contracting Co., and C. F. Lytle Co., all of that state. Using the short abbreviated name of KNWL Contractors, the companies started the job in January, 1941, under the general supervision of R. F. "Bob" McCune, their young and far-seeing General Superintendent. About $33,000,000 was involved in the contract.

Excavation

It has well been said that "excavation is the groundwork for defense". Excavation at Fort Leonard Wood was probably the greatest single problem encountered by Superintendent McCune. The geology of Fort Wood is typical of the entire Ozark area. Limestone bluffs, with some flint and chert present, are everywhere. The upper strata of limestone had disintegrated in ages past, leaving shale and hardpan. A few feet of reddish mineral-laden round alluvium gravel with from 6 to 10 feet of yellowish red Missouri clay topped off the overburden. Mix this up with rain and snow day after day and you have a picture of the dismal construction outlook in January, 1941.

Obviously the only machine suited to the job of scraping mud away to start the job was a tractor-mounted bulldozer. Ten International TD-18's, with Bucyrus-Erie Bullgraders and Model P-24 power control winches were brought in, with several Caterpillar D8's and LeTourneau bulldozers. These machines churned and pushed the top layers of mud away, and soon had built a few access roads which were stable enough to carry material trucks. In grading the

(*Continued on page 30*)

In such mud conditions at this KNWL Contractors started work at Fort Leonard Wood and in 5½ months finished the job.

Sand and Gravel Plant For Whitney Point Dam

(*Continued from page 2*)

all of the gravel from the cylindrical screen was delivered to the 36 x 15 jaw crusher. The crushed material was taken by a bucket elevator to a 3-deck Huron 4 x 8-foot vibrating screen, driven by a 15-hp G-E induction motor. All of the material at the top deck was returned by chute to the 24 x 13 jaw crusher. The other two decks furnished the 1 to 2-inch and the ¼ to 1-inch aggregate specified. All of this material was rewashed on this vibrating screen by a series of Link-Belt washer nozzles.

Stacking and Loading

The two sizes of aggregate were delivered to elevated storage bins from which trucks could be loaded direct, and when these bins were filled material was run either singly or combined on to a 24-inch Barber-Greene belt 129 feet long, driven by a 15-hp Westinghouse induction motor.

This belt delivered the material to a single-deck Niagara 3 x 6-foot vibrating screen driven by a 5-hp G-E induction motor which removed the smaller specification stone and delivered it direct to the stockpile below. The larger stone went to another Barber-Greene horizontal stacker belt 129 feet long and 24 inches wide, driven by a 15-hp Westinghouse induction motor which stockpiled this material separately.

When it was necessary to load from either of the stockpiles, trucks were rapidly filled by a Barber-Greene loader.

Sand Scrubber

The sand from the sand jacket at the circular screen was delivered to a Universal Road Machinery sand scrubber and classifier 4 feet wide x 36 feet long which delivered the wet sand over the end directly to a stockpile. As mentioned before, this sand was not used for concrete but merely for drains, mostly in the toe of the rolled-earth embankment dam.

Imported Sand

Boonville, N.Y., sand, imported for all concrete, was unloaded from hopper-bottom cars at the Whitney Point, N.Y., railroad station to a hopper of 12-yard capacity, beneath which a reciprocating feeder delivered the sand to a Barber-Greene 24-inch belt 129 feet long to a stockpile over a tunnel. A gate within the tunnel permitted the recovery of sand by delivery to a 24-inch x 60-foot long Barber-Greene conveyor which loaded directly into the hauling trucks. In order to minimize the labor required, a push-button control was installed so that the truck driver, after backing his truck under the loading belt, could start the operation and then stop it when his truck was filled by merely pushing the stop button.

Batching Plant

Adjacent to the aggregate plant the contractor installed a 300-ton Blaw-Knox 3-hopper batching plant beneath a knoll and immediately adjacent to it a 1,400-barrel Blaw-Knox cement silo with recovery equipment.

Trucks delivering Boonville sand or either of the sizes of coarse aggregate from the stockpiles, or delivering bulk cement, drove up on top of the knoll and on to a heavy bridge composed of eight 30-inch I-beams with a span of 30 feet, decked with 4-inch thick lumber of random widths, covered with tar paper and then with diagonal roofers which prevented cement, sand and water leaking through the bridge. Immediately over the top of the three aggregate hoppers were covers which could be closed in case of rain to keep the moisture content of the aggregates uniform.

Over the top of the Blaw-Knox bulk-cement silo the contractor built a large house waterproofed with roofing paper and with two sliding doors 16 feet high and 6 feet wide with hinged flaps at the center and at the ends of each door which thoroughly sealed these openings against driving rain. Both the doors and the flaps were also faced with roofing paper. No man was maintained on the top bridge when cement or aggregates were being delivered, the truck drivers being expected to shovel up their own spillage.

Cement from the 1,400-barrel cement silo was picked up by a Link-Belt rotary feeder delivering to a 10-inch Link-Belt screw which fed the bulk cement to an open hopper. When batching, the cement feed was automatic, started by a push button and then cut off by a Mercoid switch. An electric bulb immediately over the cement batcher lighted when the cement batch was completed. The batching of the two sizes of stone and the sand was manually controlled and weighed by Howe cumulative dial scales. At the unloading point on the railroad the contractor installed a Blaw-Knox 150-barrel bulk-cement plant with a spiral feed from the track hopper to 9-inch Link-Belt buckets on a chain elevator which loaded it into the plant. From this the bulk-cement hauling trucks were loaded to deliver it to the batching plant.

During the winter a 15-hp vertical boiler was installed adjacent to the aggregate batching plant to supply steam heat to the aggregate hoppers.

Personnel

The sand and gravel plant and the set-up of the batching plant were designed by Nicholas Masotti of Schenectady, N. Y., who acted as Superintendent of these plants under the direction of J. M. Sawyer, General Superintendent for the Hunkin-Conkey Construction Co., and Shofner, Gordon & Hinman of Cleveland, Ohio, to whom the contract for the construction of Whitney Point Dam and its appurtenant concrete structures was awarded. These operations were under the direction of the U. S. Engineer Department, Binghamton, N.Y., District Office, Lt.-Col. J. C. Marshall, District Engineer.

Planning surveys indicate 100,000 miles of obsolete roads and 19,000 bridges on the primary system in need of reconstruction or replacement.

Concreting Operations At Whitney Point Dam

(*Continued from page 2*)

mixed by a 27-E MultiFoote which received dry batches from batch trucks, mixed them, and delivered the concrete to the agitator hopper of a Rex Pumpcrete.

Usually, in pouring spillway aprons of this type, the monoliths are poured alternately, giving a somewhat checkerboard appearance to the site during the initial part of the pouring. It is here that the value of the screed ribs to increase the efficiency of pouring is seen. Instead of having to move the Pumpcrete pipe continuously from one monolith to another, with the need for a considerable number of angles in the pipe, this method permitted pouring the monoliths from the lower end of the spillway continuously to the top, screeding upgrade from the adjacent ribs. Thus, it was necessary to remove only one length of Pumpcrete pipe after another. The U. S. Engineer Department specifications, however, require that each monolith shall be separated from adjacent pours by a sheet metal bulkhead which must be painted with asphalt paint before the pour. This specification was fulfilled by using a prepainted sheet metal bulkhead which provided both the joint and the key between each monolith.

The Control House

The control house at the upstream end of the 13-foot horseshoe conduit is 60 feet high above the raking platform for the trash racks. It contains three 5 x 10-foot service gates, in front of each of which is an emergency opening for which is provided a single gate which may be inserted in any one of the three emergency openings should the regular gate fail. Three additional openings, one in front of each emergency opening, provide for the use of stop logs to shut off completely the discharge through one gate for repairs or because of any other emergency. These nine openings in a structure measuring approximately 45 x 35 feet in plan require very thick walls and webs between the gate openings. A total of 5,000 cubic yards of concrete was required for the pouring of the gate house above the top of the conduit.

The control house was poured in 10-foot lifts, using form panels 12 feet high and with the maximum about 35 feet long. The forms were made up with ¼-inch plywood lining with ¾-inch ship-lap backing and 2 x 6-inch studs on 1-foot centers. Double 3 x 6 wales were placed 30 inches on centers and held by Universal form clamps with ½-inch tie rods inside the concrete.

The concrete was mixed by a 27-E MultiFoote paver to which dry batches were delivered by a fleet of Ford batch trucks. The paver discharged directly into a 1-yard Blaw-Knox roller-gate bucket which was raised by a Lorain 75A crane to the proper elevation above the forms and discharged into the rectangular hopper of an elephant-trunk chute. All of the concrete was thoroughly vibrated within the forms by Ingersoll-Rand air-driven vibrators and showed an excellent surface. The same crane was used for handling the large panels of the forms. The interior of the forms was a veritable forest of heavy reinforcing adequately tied to insure proper spacing. The slots or openings for the gates were carefully gaged and a dummy structural-steel gate made and operated within the opening against the angle iron guides before the slots were finally braced to insure that the gage was proper for the gate.

Placing Tunnel Lining

The placing of the concrete lining in the 1,425-foot horseshoe conduit beneath the spillway involved one particularly novel operation. The tunnel was large enough to permit the electric-powered concrete mixer, an old 21-E MultiFoote paver, to be run into the tunnel, mix the concrete, and deliver it to the hopper of a Pressweld concrete-placing unit. The special diesel-powered batch trucks, with exhaust filtering provisions approved by State inspectors and each carrying four ¾-cubic yard batches, backed into the tunnel and delivered one batch to the skip of the electric-powered paver and a second batch to an auxiliary hopper immediately behind the skip of the paver. After the first dry batch had been delivered to the mixing drum, the paver winch was attached to the auxiliary hopper raising it and dumping the second batch into the paver skip. This was repeated with the other two batches, saving waiting time for the truck and delays in delivering the dry batches to the paver.

The tunnel was ventilated by an electric-motor-driven air propeller installed in the intake structure. Heat was provided by steam coils installed ahead of the ventilating fan.

Personnel

The contractor for the construction of Whitney Point Dam, a rolled-earth embankment structure with the appurtenant concrete structures, was awarded to the Hunkin-Conkey Construction Co. and Shofner, Gordon & Hinman, of Cleveland, Ohio, on the bid of $2,678,278.80. J. M. Sawyer was Superintendent for the contractor, E. F. Davies, Concrete Superintendent, Parley Elmer, Carpenter Superintendent, Tony Ross, Master Mechanic, and Ted Berg, Chief Electrician. The work was done under the direction of the U. S. Engineer Department, Binghamton, N.Y., District, Lt.-Col. J. C. Marshall, District Engineer, with F. R. Deland as Resident Engineer.

Sand Bituminous Paving in Georgia

9-Mile Mixed-In-Place Job on Georgia Route 32 Completed by Manley Construction Co.

By GEORGE E. ROBERTS, Resident Engineer, State Highway Board of Georgia

✦ THE completion of 9 miles of grading and bituminous paving on Georgia State Route 32, between Anguilla and the Glynn-Brantley County line, provides tourists en route by rail to Georgia's famed resort Sea Island with a 30-mile paved road from Thalmann, the nearest through rail connection with the island. This route will eventually be a direct paved highway between Alma and Brunswick, Georgia.

The new road has a 100-foot right-of-way, with a 20-foot paved section on a 32-foot road bed and 6-foot flat-bottom ditches throughout the project. The depth of the ditches varies from 6 inches on the sandy vertical peaks to 4 feet where the soil conditions and drainage requirements necessitated it. Particular attention was given to streamlining the front and back slopes which vary from 1 on 4 to 1 on 20. The terrain was studied and the sections so designed that they would blend in with the adjoining landscape. Preference was given to an approximate 1 on 7 front slope, the ditches being held to a uniform straight or gradual curving line while the ratio of slope was ignored where it did not vary over ½ to 1 between stations. Bermuda grass was planted from the pavement edge to the top of the back slope for the entire length of the project.

Grading

The grading equipment included a ¾-cubic yard dragline, seven 1½-ton dump trucks, one grader with a 12-foot blade, two Euclids and two tractors. Out of a total of 152,000 cubic yards of common and borrow excavation, 97,000 cubic yards was selected material taken from tested pits.

Material for the road bed was placed in 8-inch layers and slope material was dumped from this runway and bladed down the slopes with the grader. Then selected material was placed in the top 18 inches of the subgrade.

Material Specifications

The sand for the bituminous mixed-in-place paving was obtained from local pits and was divided into the three following classifications:

	Class 1 Per Ct.	Class 2 Per Ct.	Class 3 Per Ct.
Retained on No. 20 mesh	1	6	6
Passing 20, retained on 40	14	4	1
Passing 40, retained on 60	31	14	2
Passing 60, retained on 200	48	63	81
Total Sand	94	81	84
Total Silt	2	9	8
Total Clay	4	10	8
Total	100	100	100
Sand coarser than 60 mesh	46	18	3
Material above 10 mesh	0	0	2
Stability, pounds per square inch	105	135	106
Tar, gallons per square yard (not including tar prime)	1.96	2.34	2.49

The bituminous paving was mixed in place by a Barber-Greene bituminous mixer, using TSB-1 tar of the following specifications:

Specific viscosity at 140 degrees F	29-32
Per cent total distillate H_2O	0-2
Distillate to 455 degrees F	0-12
Distillate to 572 degrees F	0.25
Water per cent, maximum	1
Bitum, per cent soluble in CS_2, Min.	99

Mixing and Finishing

After the sand for the mix was placed and finished approximately 2½ inches high, it was windrowed by the grader to approximate subgrade. The fine grading between the paving edge and the windrow was done by hand. Six inches additional width on both sides of the road were paved with the bituminous sand mix to allow for trimming and the assurance of a firm edge.

A 10.5-cubic foot windrow was maintained in front of the Barber-Greene mixer, giving 4½ inches of compacted mix. The mixed window was usually bladed down the same day, the first operation being one round trip with an Angledozer which spread the material ahead of itself and permitted complete finishing without any heavy machinery touching the completed subgrade. The tractor for the grader had smooth tracks and the rear wheels of the grader were smooth-rimmed and 16 inches wide.

Two round trips were then made by the grader, the material being well distributed over the subgrade and enough crown formed to shed water. A pneumatic-tire "traffic" roller then compacted

(*Concluded on page* 25)

The sand and tar mix was pulverized with a disk harrow before a second application of tar.

Great Increase in Use Of Welded Shovel Dippers

The sales records of the Pettibone Mulliken Corp., Chicago, Ill., for the first eight months of 1941 show that 100 per cent more welded dippers were sold during that period than in the corresponding period in 1940, and in addition, this 1941 sales figure is just seven dippers short of equalling the entire year of 1940.

During the past three and a half years, this manufacturer of welded shovel dippers has fabricated dippers ranging in size from ½-yard up to 17-yard capacity, three quarters of their production being in the 1 to 3-yard group. Dipper weldments are inspected in the Pettibone Mulliken plant by General Electric X-ray equipment and the Magnaflux System, and a modern recirculating furnace used to stress-relieve all welds.

Another indication of the increasing use of the PMCO welded dipper principle is the fact that the number of shovel manufacturers using it has increased from four in 1938 to ten in 1940. Among these are Koehring, Link Belt, Lima, Thew-Lorain, P & H, Manitowoc and Osgood.

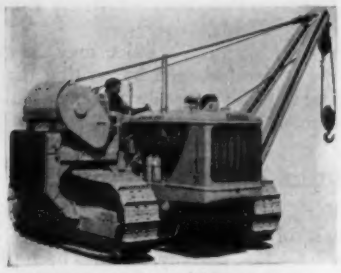
Asphalt Runway Surfacing For Bomber Flying Fields

The Asphalt Institute, 801 Second Ave., New York City, has recently issued a timely publication entitled, "Bomber Flying Fields," as a guide in the use of asphalt for heavy-duty paving. Written by W. R. Macatee, Managing Director of the Institute, material is presented in three main sub-divisions, as follows: (1) The Need for Scientific Design of Runway Pavements on Military Flying Fields, (2) Suggested Method for Field Evaluation of Subgrade Support, and (3) Specifications for Hot-Mix Asphaltic Concrete Pavement for Heavy Bomber Flying Fields.

A copy of this booklet may be obtained without charge by writing direct to The Asphalt Institute and mentioning this item.

Buda Engineer Promoted

Harold G. Smith, formerly Chief Engineer of the Automotive Division of The Buda Co., Harvey, Ill., has been promoted to the position of Executive Engineer in charge of all engineering of Automotive, Marine, Industrial Engine and Radial Diesel Engine Division.



The Trackson MD6 Pipe Layer

A New Heavy-Duty Tractor Side Crane

The new Model MD6 Trackson Pipe Layer, recently announced by the Trackson Co., Milwaukee, Wis., is a tractor side crane designed for mounting on the new Caterpillar D6 model and constructed to take full advantage of the increased power, ease of control and other improvements of this latest Caterpillar model.

The new MD6 Pipe Layer has a lifting capacity ranging from 7,300 pounds at a 12-foot overhang to 23,700 pounds at a 4-foot overhang, and is one of a complete line of Trackson Pipe Layers available with lifting capacities up to 67,000 pounds. Complete and agile, it is stated that these machines are suitable for many types of work, including laying mains for water, gas and sewer lines, handling and placing piles and poles, lifting and lugging heavy loads, erecting steel, handling materials, and generally making themselves useful on construction projects.

A new bulletin, 459, presenting complete details on this new MD6 Pipe Layer may be secured by interested contractors and state and county engineers direct from the manufacturer or from this magazine.

Priority Assistance In Road Construction

Priority assistance in the acquisition of materials for six classes of highway construction when and if shortages occur is assured in a "letter of intent" from the Office of Production Management to the Public Roads Administration. This letter made clear that the Priorities Division stands ready to facilitate the acquisition of material and supplies for access roads to defense establishments and other highway work of defense importance.

Application for priority assistance to obtain delivery of materials, supplies and equipment on schedule should be made by the state highway department concerned through the Public Roads Administration to the Project Section, Division of Priorities, Office of Production Management. If circumstances warrant, a Preference Rating Order will be issued assigning appropriate ratings to deliveries of materials.

The six classes of preference roads and ratings to be granted, as listed in the letter, are as follows:

1. ACCESS ROADS
   a) Access Roads to Military and Naval Establishments: Preference rating of the access road project shall correspond to the rating of the military and naval establishment served.
   b) Access Roads to Defense Manufacturing Plants: Preference rating of the access road project shall correspond to the rating of the defense establishment served, except that the highest rating which can be assigned is A-1-a.
2. STRATEGIC NETWORK OF HIGHWAYS

	Preference Rating
a) All bridges, tunnels, structures and approaches	A-2
b) New roads or the improvement of substandard roads and grade separation structures	A-4
c) Shoulder widening and minor drainage structures	A-10
d) All other work	B-3

3. FEDERAL-AID SYSTEM

a) All bridges, tunnels, structures and approaches	A-3
b) New roads or the improvement of substandard roads and grade separation structures	A-7
c) Shoulder widening and minor drainage structures	A-10
d) All other work	B-3

4. FEDERAL-AID SECONDARY AND NATIONAL PARK AND FOREST PROJECTS

a) Bridges and approaches	A-7
b) New roads or the improvement of substandard roads and grade separation structures	A-10
c) All other work	B-3

5. Projects for the construction or improvement of the Inter-American Highway in Mexico and Central America — A-3
6. Construction of the Trans-Isthmian Highway and the Chorrera-Rio Hato Highway in Panama — A-1-b

Randall Made Adv. Mgr. Of Wickwire Spencer

The Wickwire Spencer Steel Co. and its subsidiary the American Wire Fabrics Corp., New York City, have announced the appointment of George L. Randall as Advertising Manager to succeed K. A. Zollner who recently resigned. Mr. Randall who has had a wide experience in the publicity and advertising fields, joined the Wickwire Spencer organization in 1935.

Concrete Placing Equipment

Garlinghouse Bros., 2416 East 16th St., Los Angeles, Calif., has available a folder containing bulletins covering its complete line of equipment. Bulletin No. 54 is devoted to the new Gar-Bro truck-mixer job hopper for transferring concrete from truck mixers to concrete carts or wheelbarrows. Bulletin No. 55 covers Gar-Bro concrete buckets, both round and square types; Bulletin No. 56 covers the general Gar-Bro line, including tower buckets, concrete hoppers, rubber elephant-trunk chutes, steel concrete chutes, wheelbarrows, concrete carts, weighing hoppers and bin gates; Gar-Bro wheelbarrows and the Gar-Bro shovel barrow are described in detail in Bulletin No. 57, while another bulletin describes its line of concrete and material carts.

Copies of the bulletin covering the equipment in which you are particularly interested may be obtained by writing direct to the manufacturer and mentioning this item in CONTRACTORS AND ENGINEERS MONTHLY.

Waterfront Improvement Begun in Portland, Ore.

$4,000,000 Project Will Take State Route Through City via New Boulevard Along Willamette River

By HENRY W. YOUNG

✦ FOR a great many years, consideration has been given to making Front Avenue in Portland, Ore., a north and south arterial street. It was a part of the original Bartholomew city plan adopted by the Portland City Planning Commission some eight years ago. Now it is in process of being realized, with improvements, through the cooperation of city, state and Federal governments. Two contracts have already been let and construction is definitely under way. Therefore, Portlanders are looking forward to a waterfront that in the near future will compete with any in the country from the standpoints of beauty and practicability.

According to R. H. Baldock, State Highway Engineer, Oregon State Highway Commission, approval was received some months ago from the Public Roads Administration for this project, which is often spoken of as the Front Avenue improvement, and in preliminary engineering reports called Harbor Drive. Plans for this work were prepared jointly by the Portland Department of Public Works and the State Highway Commission, from a survey made by the latter in 1935.

The total length of the project is 3.6 miles, estimated to cost a total of $4,000,000. The plan is for the state and Federal governments to pay the $2,000,000 construction cost, the State $800,000 of the right-of-way cost and the City of Portland the balance of $1,200,000 on the right-of-way.

This project when completed will make Front Avenue a north and south arterial street through Portland, forming one boundary of the main business district, along the Willamette River waterfront. Connection on the south will be with Barbour Boulevard and the Ross Island Bridge traffic streams, from both U. S. 99E and 99W. Traffic from these routes can then be brought in from both sides of the Willamette River to downtown Portland with the minimum of delay.

At the north end, utilizing the upper deck of the railroad drawbridge, connection is to be made with both Interstate and Union Avenues on the east side of the river, leading to the northern boundaries of the city.

The drawing reproduced herewith represents the artist's conception of the down town portion of the project. To the southward from the business district the proposed highway will proceed in six lanes along Front Avenue with an over-crossing at the intersection of Kelly and Arthur Streets through which the traffic from Ross Island Bridge now flows. Continuing south on Front Avenue it joins Barbour Boulevard, which contains four lanes. Access to this for south-bound traffic will be gained by means of an underpass and ramp. Future plans call for a system of braided intersections at the Ross Island Bridge head.

Glancing at the drawing, it will be seen that along the central business district the improvement takes the form of a double highway with a parkway between. This includes what are now Front Avenue and Water Avenue, and extends to the sea wall which was built in 1929 and now becomes a very necessary adjunct to this facility. The parkway will be pierced at intervals to permit controlled access to the Harbor Drive proper, which is next to the sea wall.

Harbor Drive will join the Steel

(*Concluded on page 34*)

A Gatke moulded fabric bearing for crane track wheel and similar service.

New Moulded Fabric Bearings for Cranes

The development of special moulded fabric bearings for crane track wheel, trolley and line shaft service has recently been announced by The Gatke Corp., 228 No. LaSalle St., Chicago, Ill. It is stated that these special fabric crane bearings give many times longer service, have 50 per cent less starting friction and 30 per cent less running friction, and that they also withstand shocks and impact loads which fatigue metal bearings.

Gatke fabric bearings are non-corrosive and withstand fumes which destroy metal ones, according to the manufacturer, and withstand dirt, dust and neglect. They are moulded to finished dimensions in all shapes and sizes for replacing conventional bearings without changes.

Further information on these fabric bearings and their uses may be secured by interested contractors and engineers direct from the manufacturer or from this magazine.

Coating for Metals Prevents Corrosion

A new organization has been established to produce a variety of products for the protection and preservation of materials used in manufacturing. This Tocol line, made by Protective Coatings, Inc., 10391 Northlawn Ave., Detroit, Mich., includes complete rubber insulation as well as a line of more than thirty-five products for the protection of building structures, metals used in production, and for the protection of many types of materials against water, sun, acids and alkalies as well as general wear.

Aquanil, a non-oxidizing waterproofing material, is used for concrete, stone, wood, brick and metals. Deox is a metal conditioner for all metals, while Volcazite protects metals against all forms of corrosion.

The organization is headed by H. Tom Collord, who has been cooperating with a group of industrial laboratories for several years in the development of serviceable protective coatings. He is the founder of Collord, Inc., maker of rubberized production parts for the automobile industry, and is also founder and president of Paramount Rubber Service, Inc., producer of tank linings.

Crater Eliminator For Electric Welding

Crater formation in metallic arc welding is known to be caused by an abrupt breaking of the welding arc which does not give the molten metal at the end of the deposit an opportunity to become free of gases and slag. In many applications, the characteristics of the typical arc crater are objectionable, and it is necessary to chip out the crater until metal of normal density and soundness is exposed before proceeding to continue the deposit.

To eliminate the need for this chipping and rewelding operation, a new auxiliary device known as the Stroco crater eliminator has recently been announced by the Wilson Welder & Metals Co., 60 E. 42nd St., New York City. This device is mounted on the body of the arc-welding generator and is connected in series with the excitation field of the generator and controlled by a switch which enables the operator to cut it in and out of the excitation field circuit at will. When introduced into the circuit, it functions as a variable resistance of large enough capacity to build up the resistance and thus lower the excitation field, thereby making it possible to reduce the current density gradually without disturbing the current setting of the welding generator. It is thus possible to accomplish a tapering off or fading of the current instead of an abrupt change. The weld deposit made under these conditions is free of porosity at the end, and has a smooth, even contour instead of the typical depression, according to the manufacturer.

Further information on the Stroco crater eliminator may be secured by interested contractors, engineers and welders direct from the manufacturer by referring to this item.

Crusher Operation And Lubrication

The August, 1941, issue of "Lubrication", a technical publication of The Texas Co., 135 East 42nd St., New York City, devoted to the selection and use of lubricants, contains an outstanding discussion of the operation of jaw, gyratory and hammermill crushers and their lubrication problems, illustrated with many sectional drawings and photographs. The 12 pages of this issue make a valuable guide to the lubrication of all types of crushers, and should be in the files of the master mechanic of every contracting organization and every county and state equipment superintendent.

Copies may be secured promptly by writing to The Texas Co. and mentioning this item.

Five Types of Fill For New Earth Dam

Varied Equipment Used To Haul Material from Pits at Surry Mt. Dam In New Hampshire

By SPENCER JONES

(*Photos on page 44*)

✦ THE $1,546,000 Surry Mountain flood-control dam, which crosses the Ashuelot River 5 miles northwest of Keene, N. H., presents an interesting opportunity to observe some of the many ways in which material is hauled from borrow and cut to embankment. The contract for the construction of the dam and appurtenant structures was let to A. I. Savin Construction Co., Hartford, Conn., at a bid price of $886,000, the difference between this amount and the $1,546,000 estimated total cost being accounted for by purchase prices of lands, easements and rights-of-way.

A part of the Connecticut River Flood Control Project, Surry Mountain Dam is a rolled-fill earth embankment 83 feet high and 1,670 feet long, with a top width of 30 feet and a maximum base width of 600 feet, containing approximately 900,000 cubic yards of earth and 130,000 cubic yards of rock. The earth fill consists of a core of select impervious material backed by random impervious fill with outer shells or shoulders of pervious material and exterior gravel slopes covered with heavy blankets of rock.

The purpose of the dam, which is one of eight on several tributaries of the Connecticut River, is exclusively to regulate the discharge of the Ashuelot River and prevent synchronization of flood flows from the Ashuelot with those occurring in the Connecticut. Under normal conditions, no water will be impounded.

Located at the narrow southerly portion of a comparatively wide valley, the Surry Mountain Dam can, under flood conditions, hold back 32,500 acre-feet of water, equivalent to 6.1 inches of run-off from the drainage area of 100 square miles above the dam, and the temporary lake will cover an area of 970 acres.

The underlying rock at the site is a blocky granite. At the right or west abutment, this granite is exposed in a rounded side hill and rises from the river's edge to about 300 feet above the stream bed. In the middle of the valley this granite is buried beneath a thick deposit of glacial silt and clay which overlies a compact glacial till formation. The east abutment is a compact formation of the same glacial till overlaid by a mantle of sand and gravel.

Design

Suitable materials were available either at or within 2½ miles maximum distance from the site for construction of the embankment. The rolled-fill method for depositing and consolidating fill was chosen by the U. S. Engineer Department, Providence District Office, by whom and under whose supervision the project was designed and is being constructed. Chief among the reasons for the selection of this method was the fact that by it a considerable portion of the dam could be built before the river, located on the west side of the valley, is diverted. Secondly, it was considered desirable to build the earth portion of the dam slowly to permit thorough consolidation of the materials. Lastly, the rolled-fill method permits the economical use of materials obtained from necessary excavations and from adjacent borrow areas. In fact, all of the rock from structure excavation will be used in embankment construction, and in various rock fills outside the embankment. A minimum total of 130,000 cubic yards is required for the embankment, and for the other fills approximately 11,000 cubic yards.

A LeTourneau Tournatrailer dumping overburden at Borrow Area A.

The select impervious core section of the dam is 15 feet wide at the top, has a 1 on ½ slope both upstream and downstream, and is centered over the cut-off trench, which is 10 feet wide at the bottom with 1 on 1 slopes upward to the

(*Continued on page 33*)

C. & E. M. Photo
M. A. Gammino used all new equipment on the West Shore Road, finishing the the concrete with a Blaw-Knox machine.

Rhode Island Highway Widened and Rebuilt

(*Continued from page 7*)

given a thorough breaking in before they left for the Charlestown dual-highway contract.

The paver was run outside the forms while pouring the first lane and inside the forms on the second lane because there was no room to run it outside and it was necessary to keep traffic moving on the road at all times. The dry batches were prepared at the Allens Avenue plant of M. A. Gammino in Providence, approximately 6 miles from the job. A fleet of sixteen trucks was used, including nine 4-batch Autocar trucks, and seven Mack and Ford trucks hauling three batches each. The skip man dumped the batches and watched the paver hose which was carried across the traffic lane on a heavy boom lashed to the top of the paver. Water on this job was secured from the Warwick Water Department, and taken from hydrants through 1½-inch Crown meters. A Water Department employee was on the job at all times, keeping one meter on the hydrant ahead of the paver so that when the hose was shifted all water would be metered and accounted for. Warwick buys its water from the City of Providence.

Whenever the subgrade was dusty it was thoroughly wet down, using a garden hose attached to the paver water connection, and the same man also cleaned up along the forms and watched for any aggregate or cement which might be spilled from the skip. The concrete was mixed one full minute in the 34-E Ransome dual-drum paver and then delivered mid-way between the forms where two pit men were required ahead of the Blaw-Knox spreader with its reciprocating device which, on the first pass, struck off the batch 2 inches below the top of the forms so that the Concrete Steel Co. welded fabric could be placed at the proper elevation in the slab. To insure the proper overlap of the reinforcing fabric, three longitudinal rods at the end of each mat laid on the concrete were turned up and then the first transverse rod for the next mat was placed over these turned-up rods and they were then bent down so that the mats were locked together and lapped 9 inches. Three men handled the placing of the reinforcing fabric and the expansion joints.

The 35-foot boom of the paver made it possible to reach back and pour the top 2 inches of the slab without it being necessary to move the paver after pouring the bottom course. The Blaw-Knox spreader then went over the top course and was immediately followed by the new Blaw-Knox mechanical finisher with its hydraulic lift for the screeds. This machine made two passes over the concrete, carrying a light grout on the second run. These three new machines and the well-timed batch-truck fleet made it possible for the paver to average between 2,100 and 2,200 feet of finished slab per 10-hour day.

Expansion Joints

The expansion joints were set uniformly 73.5 feet apart with no deviation for curvature, intersections or changes in grade. The joints consist of ¾-inch thick Johns-Manville compressed cork set with a notched bulkhead on the side toward the paver and with a cap with a 1-inch leg on the bulkhead side and a 4-inch leg on the other side. Eleven ¾-inch round smooth dowels, spaced 1 foot apart and extending 12 inches on either side of the expansion-joint material at mid-height, were capped alternately. The bulkhead used by Gammino is bent back at the ends to form a 15-inch wedge-shaped wing to hold the bulkhead vertical. Three pins were used in addition to steady the bulkhead and were driven through loops welded to the steel. To insure the proper alignment of the dowels, they were tied to a transverse ½-inch deformed bar running the entire width of the slab and were supported by ¼-inch bar chairs which ran beneath the expansion joint material. As added reinforcement at the joints, a U-bar of ⅝-inch round deformed steel was placed on both sides of the joint 2 inches down from the top, 2 inches away from the expansion joint, and 2 inches from the forms.

No vibration was specified on this job, either at the expansion joints or

(*Concluded on next page*)

C. & E. M. Photo
M. A. Gammino's new Ransome 34-E delivers a batch for the surface course.

Finishing and Curing R. I. Concrete Pavement

(Continued from preceding page)

against the forms. The contractor did have one man spading constantly against the forms, who also helped with the placing of the steel reinforcing.

Finishing the Pavement

Immediately behind the Blaw-Knox mechanical finisher a 12-inch canvas belt was pulled across the pavement and forward simultaneously to give as smooth a surface as possible for checking with the 10-foot wooden straightedge. Any slight irregularity shown up under the belting was immediately corrected with finishers' "sleeve board" floats. When the hand finishers pulled the cap from the expansion joint, they put in a ¾-inch square bar and used it as a guide for finishing the two sides of the joint. Then the 10-foot straightedge was used across the joints and forward to the point where belting had been completed. In this same section one of the finishers gave a rough trim to the edge of the slab against the forms, following which the straight-edging was completed and then the pavement given a broom finish, followed by the final edging against the forms.

Two men placed Sisalkraft waterproof paper over the concrete as soon as it could be placed without marking the green concrete. Due to high winds some trouble was experienced in keeping the paper on the surface, but it was heavily weighted with stones, lumber, boxes in which the expansion-joint material had been shipped, and with gravel at the edges. The paper was left on 72 hours after which it was removed, rolled up and hauled forward for re-use. The pavement was opened to traffic in an average of 10 days after pouring. During this period, heavy timber ramps were built spanning the new concrete at crossroads where it was necessary for traffic to gain access to the other side of the concrete.

After curing was completed and the paper removed, the expansion joints were cleaned of any grout which had run onto the cork during finishing, and the top ¾ inches of the joint poured with asphalt, using standard hand pouring pots. The joint material was received in drums which were mounted over a 2-wheel asphalt kettle for melting with a Hauck torch.

Precast Durastone curb in sections 72 inches long and 18 inches high were set so as to expose a peam-hammered face 7 inches high, after the parking lane of hot-mix asphalt had been laid. These precast sections are 10 inches thick at the base and 6½ inches thick at the top. Four men set the precast sections, using a novel 2-wheel derrick with a Sasgen hand winch. Two pieces of reinforcing cast into each section made it possible to pick it up with the hand winch by means of two hooks from the winch cable when the two men operating the winch were standing on a small platform at the outer end of the derrick. When the curb was lifted clear of the ground the two men stepped off the platform and raised the end of the derrick so that the curb was swung outward and down into the prepared trench. A spacer plate was put between each section to give a uniform space for the final joint.

Personnel

The contract for grading and paving the 2.25-mile section of West Shore Road through Conimicut in the Town of Warwick, R. I., was awarded to M. A. Gammino Construction Co. of Providence, R. I., on its bid of $183,635. The work was closely followed by the principals of the company and was done under the direction of Edgar Fedeli, Superintendent. For the Rhode Island Department of Public Works, Division of Roads and Bridges, Arthur W. Suddard was Resident Engineer.

A New Vise Stand For Repair Shops

The new heavy-duty Vistand with integral chain vise recently announced by the Armstrong Mfg. Co., Bridgeport, Conn., is particularly adapted to use in state and county maintenance depots and repair garages as well as in contractors' repair shops. It is the huskiest model in this line of Armstrong-Bridgeport equipment, and at the same time is light enough to be easily portable, is well balanced and designed to prevent tipping or tilting.

The platform measures 14 inches in width and depth and has notches and slots for tools around the rim. It is also equipped with three benders, one for ¾-inch pipe and reverse benders for ½ and ¾-inch pipe, placed directly over the right front leg to guard against tipping during the bending operation. Another feature of the Vistand is that the dope pot, cast into the platform, is round and large enough to hold a pound can of thread dope while three equidistant lugs,

The Armstrong Vistand.

cast on the rim of the oil-can recess, prevent the can from jiggling or slipping off. An adjustable ceiling brace screw is another feature. The unit's feet are punched for attaching to the floor, or Armstrong-Bridgeport rubber shoes, which prevent scratching or skidding, may be used. The jaw of the vise is heat-treated by a patented process and the teeth, which have hard long-wearing surfaces, are accurately spaced to hold each size of pipe. Each tooth is cut to prevent it from filling up with scale, according to the manufacturer.

Compact Asphalt Plant For Naval Air Station

(*Continued from page* 1)

plant by tank trucks, each of which was equipped with a transfer pump which permitted the delivery of the asphalt direct to one of the two 10,000-gallon asphalt storage tanks which were equipped with steam coils. An asphalt pump, driven by a gasoline engine, pumped the hot asphalt through a loop to the weigh box on the batching platform and back to the tanks, providing constant circulation. The weigh bucket was covered and had a steam jacket to prevent accumulation of the bituminous material in the bucket. Adjacent to the asphalt storage tanks were two 4,000-gallon tanks for fuel-oil storage for the diesel engine and the heating torches of the drier.

Mixing the Batches

The Navy specifications required two mixes, one for base and one for top, and these were uniform for the runways and for road paving. The batch weights for the 2½-ton batches were:

	Base	Top
1¼-inch stone	1,970 lbs.	...
⅜ to ½-inch stone	1,260 lbs.	2,065 lbs.
½-inch stone	....	850 lbs.
Sand	1,500 lbs.	1,760 lbs.
Asphalt	270 lbs.	325 lbs.
	5,000 lbs.	5,000 lbs.

There were two dial scales on the batching platform, one of which was used to weigh out the three aggregates and the other for the asphalt. After the aggregate was dumped into the pugmill and given a thorough dry mix, the asphalt was dumped in and given a 45-second mix for base and a 1-minute mix for top. The resulting 2½-ton batch was homogeneous and fluffy so that it transported readily and was easily raked when spread.

Hauling was done by a fleet of six to eight trucks carrying four batches per truck. A man on a small raised platform at the entrance side of the plant checked the bodies of the trucks as they came in and oiled them with fuel oil as necessary to prevent sticking of the batches.

Labor and Production

The plant was usually operated on two 8-hour shifts a day, but went to three when the highest production was necessary. The plant regularly produced 950 tons of base or 700 tons of top in an 8-hour shift. The operating crew at the plant consisted of the plant foreman, one crane operator, one bulldozer man working on the stockpiles, one feeder man, one drier man, one engineer and maintenance man, one oiler, one asphalt pump man, one batcher and mixer man, one fireman, and one coal passer.

Creosoted Black Gum Surface for Bridges

Highway departments frequently place creosoted black gum as a floor or wearing surface on old steel bridges, according to a recent issue of *Wood Preserving News*. The usual method in building a wood floor system for such structures is to place a creosoted subfloor of Douglas fir or southern yellow pine plank transversely on the stringers, and bolt to it a wearing surface of creosoted black gum plank, laid longitudinally. Dressed plank of 3-inch nominal thickness is generally required to secure a smooth even surface suitable for fast motor traffic.

The Kansas State Highway Department has installed a number of such decks, and their specification requires that the black gum be common dimension plank, free from wane, and pressure-treated with a final retention of 10 pounds of creosote per cubic foot. The planks are fastened to the subfloor by carriage bolts at the ends and along the sides. Experience has shown that the best results are obtained from black gum wearing surfaces if the heart faces are turned down and only the sapwood face exposed to traffic.

One of the early floors of this type on the Kansas state highway system was placed in 1933 on the bridge over the Marias des Cygnes River on Highway 69 at Trading Post. This bridge is about 225 feet long, and traffic ordinarily ranges from 1,200 to 1,500 vehicles daily. The subfloor is 3 x 12-inch x 16-foot pine and the gum plank surfacing is of the same size, treated with 10 pounds of creosote per cubic foot. The curbs are of creosoted pine.

It is reported that this floor is free from decay and in excellent condition. The only noticeable wear that occurred was in a few planks which were laid with the heart side up. In these, the centers had shelled out a half inch or so, but were evened up with asphalt by the maintenance crew.

Portable Electric Tools

The Wodack Electric Tool Corp., 4627 W. Huron St., Chicago, Ill., has available a new catalog devoted to its line of electric tools for construction, installation, production and maintenance. These include various models of portable electric drills, the Do-All electric hammer and drill, plaster cutters, a sander and grinder, disc sanders, disc sanding edgers, and accessories.

Copies of this illustrated catalog, No. 45, may be obtained by writing to the manufacturer and mentioning this item.

Bituminous Paving At Quonset Naval Base

(*Continued from page* 1)

being on natural land which was graded to the proper elevation. The four great runways were laid in 10-foot strips with a 3-inch base course and 1½-inch top. To insure uniformity of depth and ease of checking with the 10-foot straight-edge after rolling, 3-inch steel forms with a 4-inch base were set and held firmly in place with three spikes for each 10-foot length of form.

A fleet of six trucks was used on an average 1½-mile haul, with two added for greater distances, to convey the asphalt mix from the plant, centrally located on the reservation, to the site of the work.

To deliver the batches the trucks backed up to the hopper of the asphalt finisher and two men, one at each side, controlled the delivery of the asphalt to the hopper and also shoveled material in the hopper for uniform distribution. The number of trucks was so well controlled that the production of the finisher was maintained at a high level. The spreader pushed the trucks ahead during the delivery of the load from the bodies to the hopper.

Behind the machine two wing men maintained the finishing operation at the proper elevation and the exact width of the 10-foot strip between forms or between a previously laid strip and the single form on the outside. These men also raked as required in making the joint between two adjacent strips. Immediately following the spreading and tamping of the asphaltic concrete by the finishing machine, it was rolled by a 10-ton tandem roller and then checked with a 10-foot straight-edge for high or low spots. The uniformity of production kept the number of such yellow rings or crosses at a minimum in spite of the speed of operation.

Several crews, as described above, were operating at different points on runways and paving, with each crew laying down an average of 5,000 square yards of base in an 8-hour day or 9,000 yards of top.

Personnel

The new Naval Air Station at Quonset was built by the United States Navy, with all design and supervision in charge of Commander Raymond V. Miller, C.E.C., Officer in Charge of Construction. The contract was carried out by George A. Fuller Co. and Merritt-Chapman & Scott Corp. of New York City, acting as associates, with E. Walter Hammer as Project Manager.

Modern Developments In Reinforced Concrete

The Portland Cement Association, 33 W. Grand Ave., Chicago, Ill., has recently issued a folder, entitled "Modern Developments in Reinforced Concrete". The 16-page folder contains four articles, as follows: "150-Foot Rigid Frames Solve Hangar Roof Problems" by William N. Nielsen, Architect and Engineer, Des Moines, Iowa; "Moment Redistribution in Reinforced Concrete" which is an abstract of a paper by W. H. Glanville and F. G. Thomas, with comments and discussion appended; "Hollow-Type Concrete Construction in Bridges"; and "20-Inch Column Designed for 1,000,000-Pound Load" which was taken from a paper in the Journal of the American Concrete Institute, April, 1941.

Those interested in concrete and its uses should find this folder interesting and informative. Copies may be obtained direct from the Portland Cement Association by mentioning CONTRACTORS AND ENGINEERS MONTHLY.

A Dresser Warehouse For Houston, Texas

A new Southwest warehouse has been opened by Dresser Mfg. Co. of Bradford, Pa., at Houston, Texas, to make available ready-made joints overnight for the speedy laying of pipe-lines for both oil and water purposes. The new warehouse is located at 1121 Rothwell St., Houston, and is in charge of David H. Geiser, Manager. C. T. Davis, District Manager, Water and Gas Division, and H. R. Shidel, District Manager, Oil-Field Division, will have their headquarters at the new District Office located at the warehouse.

All-Welded Dipper

A number of new features have been incorporated in the new P & H 1½-cubic yard all-welded dipper recently announced by the Harnischfeger Corp., 4419 W. National Ave., Milwaukee, Wis., for its Model 655-A hydraulic excavator.

Besides the stability gained by welded construction, there are the features of a renewable manganese lip, renewable dipper teeth, and improvements in the latching mechanism. By providing a heavy shell, simplicity of reinforcements and a sturdy padlock frame with large sheave, a maximum in overall strength and rigidity has been secured, the manufacturer states. Another important feature is the absence of corner welds, which is achieved by forming the back of the dipper of the parent metal instead of the inserted plate-type back.

The new P & H welded dipper.

Further details on these new dippers and on the Model 655-A excavator may be secured by those interested direct from the manufacturer or from this magazine.

COUNTY road work. In Matagorda County, Texas, its Caterpillar motor grader is used for regular road construction and maintenance, but when there are trucks to be loaded or side casting to be done, an elevating grader is hooked on and the motor grader provides the traction.

TIME OUT for fun at the Fourth Pan American Highway Congress in Mexico City last month. Hal G. Sours, President, A.R.B.A., and Director, Ohio Department of Highways; L. B. Yost, Public Relations Department, General Motors Corp.; A. W. Rohlen, President, American Association of Motor Vehicle Administrators; and J. S. Williamson, President, American Association of State Highway Officials, explore the floating gardens at Xochimilco.

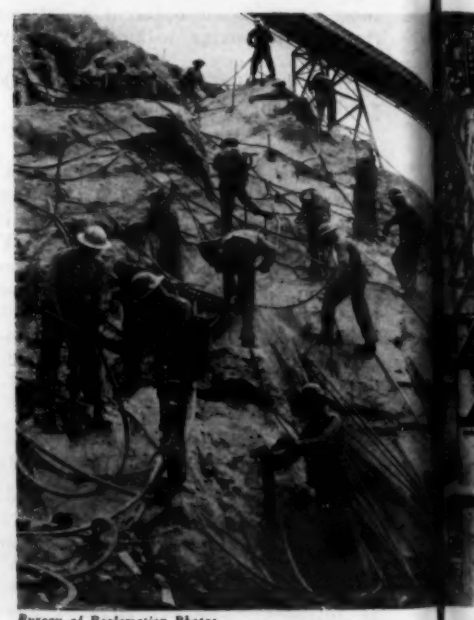
Highway Information Service Photo

PANAMA-BOUND. A gigantic 50-ton Mack Super Dumper, one of sixty-nine of these units to be used in the construction of the third set of locks at the Panama Canal, receives greetings to workers on this vital defense project from girls in the cast of the current Broadway show "Panama Hattie". Costing more than $1,000,000, these monster Macks will play their part in this tremendous excavation job which involves moving more than 35,000,000 cubic yards of rock and earth.

DEFENSE. Alongside the Barber-Greene tamping-leveling finisher at work on the roads at Camp Custer, Michigan, is one of the Army's Blitz-Buggies, shown at the left. The finisher, owned by Louis Garavaglia, is laying 3-inch base course of gravel.

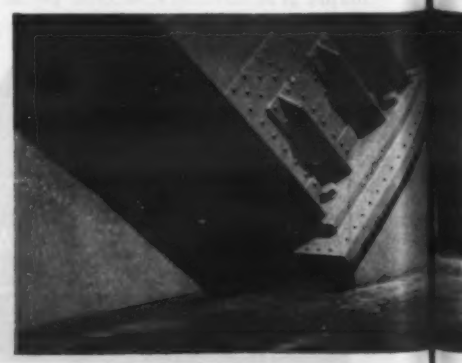
SKELETONS they look like, but actually they're steel cutter heads which were in operation 24 hours a day at Fort Peck, Montana. To lengthen their life, the heads were removed and the blades built up by using Hobart welders and Stoodite electrodes.

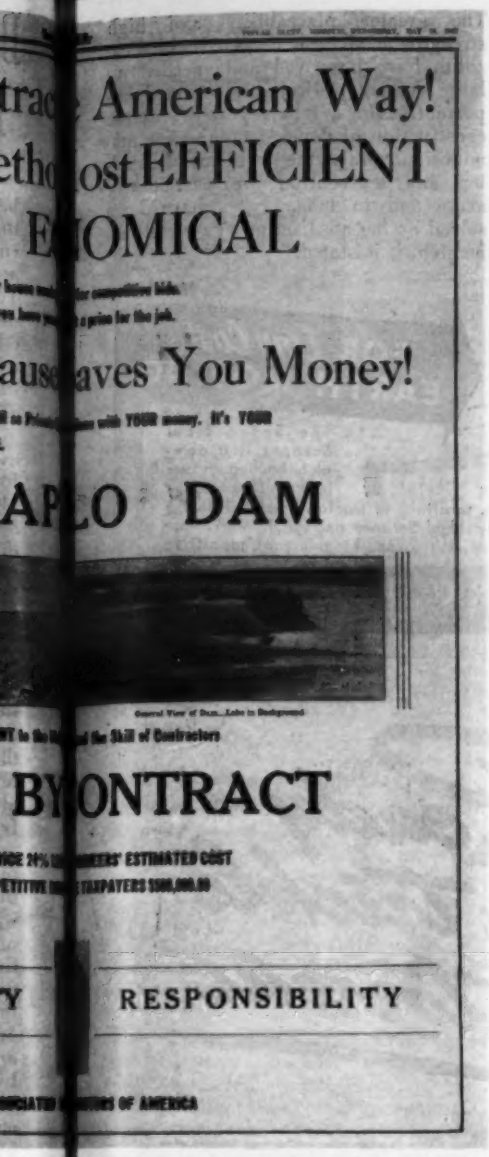
PUBLICITY. This fine example of publi page advertisement in the paid for by the Porter-DeWitt Construction is made of the company in the ad. This was



Bureau of Reclamation Photos

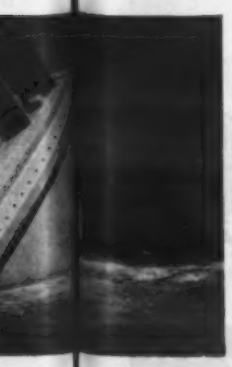
SHASTA DAM. Drillers in action, at ment of Shasta Dam starts for home. But other men take their pl





of public "Build by Contract" system appeared as a full-page in the American Republic, of Poplar Bluff, Mo., and was an invitation for Wappapello Dam, although no mention of this was a contribution to the industry and to the public.

ion, at left, to blasting out rock for the west abutment of the Dam and, at right, the day shift on the dam as their plant goes on around the clock, 365 days a year.

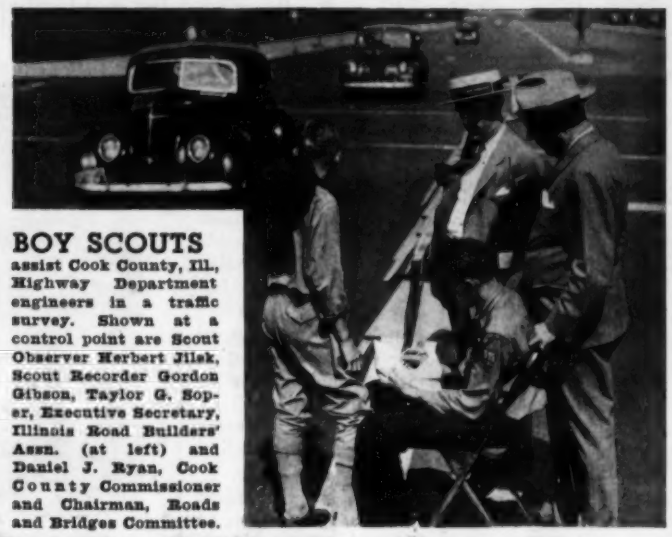


FAKE. An interesting feature of the construction of Hangar No. 1 at the new Washington National Airport is a two-hinged arch with false abutments so that the arch appears to spring from the abutments.

C. & E. M. Photo

BORROW. On its highway project on U.S. 42 south of Wichita, Kansas, List & Clark used a LeTourneau Carryall and D8 tractor to haul dirt from the borrow pit. The unit made ten trips an hour, with an average load of 15 yards and an 800-foot haul.

SUBWAY. Busily at work in the construction of the Chicago subway is this Traxcavator mounted on a D4 tractor working in sticky clay. The outfit is owned by R. R. Anderson of Chicago.

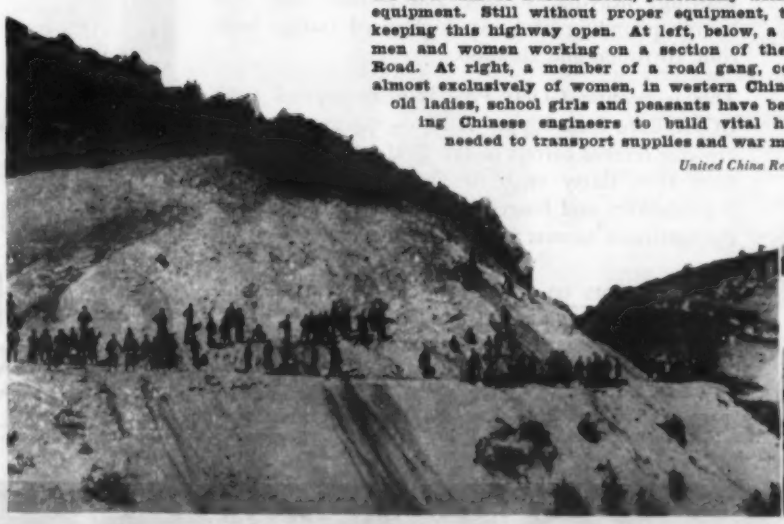


BOY SCOUTS assist Cook County, Ill., Highway Department engineers in a traffic survey. Shown at a control point are Scout Observer Herbert Jilek, Scout Recorder Gordon Gibson, Taylor G. Soper, Executive Secretary, Illinois Road Builders' Assn. (at left) and Daniel J. Ryan, Cook County Commissioner and Chairman, Roads and Bridges Committee.

ON DISPLAY. The new high-speed LaPlant-Choate CW-10 Carrimor scraper being loaded by a Link-Belt Speeder dragline at the recent meeting of LaPlant-Choate distributors from all parts of the United States, Canada and Mexico at the company plant in Cedar Rapids, Iowa.

CHINA carries on. Since the Japanese invasion, the Chinese have learned the value of highways and, in the face of tremendous odds, built the now-famous Burma Road, practically without any equipment. Still without proper equipment, they are keeping this highway open. At left, below, a gang of men and women working on a section of the Burma Road. At right, a member of a road gang, composed almost exclusively of women, in western China where old ladies, school girls and peasants have been helping Chinese engineers to build vital highways needed to transport supplies and war materials.

United China Relief Photos



The new Lima Type 603.

Combination Shovel, Dragline and Crane

When used as a shovel, the new Lima Type 603 made by the Shovel and Crane Division, Lima Locomotive Works, Inc., Lima, Ohio, is equipped with a 21-foot boom, a 17-foot dipper handle and a 1½-yard dipper; as a crane it has a maximum lifting capacity of 25 tons; and as a dragline its capacity varies with the nature of the work.

The shovel boom is of the box-type design, electrically welded throughout, the dipper handle is of the same construction, and power is furnished by a gas, diesel, oil or electric power unit. The Type 603 is equipped with inside expanding clutches with housings cooled through radiation fins; clutches and brakes are of extra large diameter; and the hoist clutches are equipped with vacuum power assistors operating through toggles which makes possible the raising or lowering of loads with accuracy and ease without the operator losing the "feel" of the work, according to the manufacturer.

Each major operation is independent of the other, which makes it possible to hoist, travel, swing and raise or lower the boom simultaneously. The crawler truck is composed of a one-piece base casting with four through axles on the ends of which revolve eight open-type self-cleaning rollers. The crawlers are so designed that they can be extended in length to increase the ground bearing area, and the change can be made in the field without dismantling the machine. The cab has an in-built winter front which may be removed when not needed, and more than one half of the cab can be opened to give ample ventilation in summer.

Further information on the Lima 603 may be secured by those interested direct from the manufacturer.

Cement Dispersion Improves Concrete

Better design of concrete mixes and more care in the selection of aggregates have vastly increased the quality of concrete and mortar, but the reduction of excess water necessary to place concrete has called for further investigation. The Research Laboratories of the Master Builders Co., Cleveland, Ohio, producer of Pozzolith, recently reported that by adding to the concrete or mortar mix a cement-dispersing agent, the excess water required for placeability is reduced, improving workability, watertightness and strength.

When placed in water, the particles of a solid tend to gather and act as large clumps rather than as individual particles. This flocculated condition is due to the absence of electrostatic charges on the particles. If a dispersing agent is incorporated in the flocculated solid-liquid system, then the clumps tend to be broken up and the solid particles are dispersed or distributed more or less evenly through the water. This effect may also be enhanced by the action of the dispersing agent as a protective colloid which prevents the particles coming in close contact with one another.

The dispersion of portland cement in a concrete or mortar mix is important in a number of respects. The reactions on which portland cement depends for its bonding properties are surface reactions. For this reason cement manufacturers have consistently increased the fineness of grinding of cement clinker. The full surface area produced by fine grinding is not available for reaction due to the flocculated condition of the cement in the mix, and this tendency is even greater with greater fineness so that the beneficial effects of fine grinding have been in some measure offset by the formation of clumps. The addition of a dispersing agent to portland-cement mixes makes available for reaction the full surface area of the cement particles.

The effects of dispersion of the cement particles on plastic concrete or mortar may be summarized as follows: 1. More placeable concrete with less water; 2. Increased fattiness; 3. Reduced segregation and bleeding; 4. Greater water retentivity; 5. Reduced shrinkage before hardening; 6. Great economies. On the hardened concrete the more important results of a dispersing action may be cited as follows: 1. Increased durability and longer life; 2. Increased watertightness; 3. Higher strength; 4. Lower volume change; 5. Lower permeability or absorption; 6. Greater uniformity and freedom from gross defects.

The principle of dispersion has been widely applied in practical construction. The greater placeability and high strengths at all ages obtained with Pozzolith have improved and speeded up large defense projects and effected important savings, it is reported. In the construction of dome structures for ammunition storage, the problems of bleeding and segregation are particularly acute and in many cases have been solved by the application of cement dispersion, it is stated.

The edges of the pavement were carefully and uniformly cut to a sloping concave surface exposing the entire thickness of the pavement, and then sealed.

Mixed-in-Place Road Work on Georgia 32

(*Continued from page* 12)

the material sufficiently to keep any water from penetrating to the subgrade during the period of aeration. In hot dry weather, four days was usually sufficient time for aeration, at the end of which time the mix was pulverized with a disk harrow and further mixed by the grader, cutting to within 1 inch of the subgrade. After shaping to a template, a 5-ton tandem roller was used, beginning at the edges and working to the center. Particular attention was given to securing well compacted edges.

This operation was followed by the traffic roller and again preference was given to the edges, as regular traffic provides plenty of compaction in the center of the road. At this stage the pavement had been shaped and checked by a template on which a spirit level was attached so only slight irregularities remained. These were planed off the following day, all planed material being wasted off the edges. A thorough rolling by the traffic roller followed, and the road left to cure properly before priming.

After about two weeks the surface was thoroughly cleaned by a blower and tar of the same grade as used for the initial mixing was applied at the rate of 0.25 gallon per square yard. The prime was then dusted with sand from the shoulders and traffic permitted over the road immediately afterward. In several instances there was some trouble with ruts caused by heavily laden trucks while the mix was still comparatively green but these were corrected satisfactorily by the use of the traffic roller.

The Seal Coat

After the prime had cured sufficiently, which on this project required about six weeks, and before proceeding with the seal, lines were laid down both sides of the pavement and the edges cut to a uniform line. This was very economically accomplished by attaching a shaft and disk blade to the regular grader blade, the grader being pulled by a smooth-track tractor. The result was a sloping concave surface exposing the entire thickness of the pavement which was easily sealed by dropping the end nozzles of the spray bar on the bituminous distributor and angling them with the slope of the cut edges.

The pavement was sealed with an application of 0.25 gallon per square yard of AC-23 asphalt of the following average laboratory tests:

General characteristics	Semi-solid, water-free
Specific gravity, 60 degrees F/60 degrees F	1.021
Flash point (degree F.)	405
Penetration, 77 degrees F, 100 grams, 5 sec.	292
Melting point (degree F)	101
Ductility, 77 degrees F	100 cms
Total bitumen (Soluble in CS_2)	99.8

This asphalt was applied at a temperature of 350 degrees F and immediately afterward coarse Altamaha sand of the following average gradations was applied by means of a spreader box at the rate of 20 pounds per square yard:

Sieve Analysis	Retained	Passed
No. 3	0 per cent	100 per cent
No. 4	3 per cent	97 per cent
No. 10	18 per cent	79 per cent
No. 40	75 per cent	4 per cent
No. 80	3 per cent	1 per cent
No. 200	1 per cent	0 per cent

Personnel

The contract for the paving on this project was awarded to the Manley Construction Co. of Ocala, Fla., at the following bid prices:

Sand tar road mix	$0.11 per square yard
Application, tar	0.0099 per gallon
Seal, asphalt	0.02 per gallon

These prices included heating, hauling and mixing all of the bituminous materials. The contractor furnished all paving equipment and skilled labor, while the unskilled labor was furnished by the WPA which also did the grading on the job. The operator of the dragline used in the grading operations was furnished by the Glynn County Highway Department, and the project was supervised by the State Highway Board of Georgia, with the author as Resident Engineer.

New Dealers Appointed

Le Roi Co., Milwaukee, Wis., announced recently the appointment of the following new distributors to handle the Le Roi line of air compressors in and around the cities in which they are located: W. T. Walsh Equipment Co., 3088 W. 106th St., Cleveland, Ohio; Wylie-Stewart Co., 1400-26 Exchange Ave., Oklahoma City, Okla.; H. W. Findley Co., 2 Glass Ave., Carnegie, Pa.; and Grafflin S. Prather, 7 Canal St., Red Bank, N. J.

New Cleaning Handbook For Fleet Operators

The Magnus Chemical Co., Inc., Garwood, N.J., manufacturer of equipment-cleaning materials, hand cleaner and industrial soaps, has recently issued a 50-page illustrated booklet entitled "The Fleet Operators Cleaning Handbook". Written for all persons concerned with safe, efficient and economical operation of motor trucks and other automotive equipment, it describes and discusses cleaning methods and materials for use in the maintenance of vehicles and cleaning operations in and around garages.

Copies of this informative booklet, which is profusely illustrated with photographs of actual cleaning operations, may be obtained by writing direct to the Magnus Chemical Co. and mentioning this item.

At left, carrying up the falsework for the arch rib forms for Big Tujunga Bridge, and completed above.

High Arch Bridge Over Wide Canyon

New Concrete Structure Is Part of the Angeles Forest Highway Built by Los Angeles County in California

By OWEN H. BARNHILL

✦ BRIDGING the Big Tujunga River in the Sierra Madre Mountains of Southern California was the hardest job encountered by the Los Angeles County Road Department in building the Angeles Forest Highway, the recently completed 24-mile extension of a new mountain route between Pasadena and Palmdale. The contract for this structure, which was designed by Los Angeles County Road Department engineers, was awarded to Person & Hollingsworth, Alhambra, for $113,390. Work was started, on May 28, 1940, and completed May 26, 1941.

There were several special problems to be met in the design and construction of the Big Tujunga bridge. The roadway had to be carried across a canyon 185 feet deep and 450 feet wide. Because of the danger of cloudbursts in this mountainous territory and the resultant flash floods, the stream bed had to be left unobstructed, and therefore the falsework had to be attached to the steep and rocky walls of the canyon. All material, including over 1,000,000 pounds of lumber and 4,700 tons of aggregate, had to be lowered into position from a cable across the canyon. All supplies were hauled 75 miles from Los Angeles, the last 17 miles being over the northern section of the uncompleted Angeles Forest Highway. A tunnel 1,600 feet north of the bridge site left little work room. Half of this limited space was occupied by a camp for 50 workers, and the remainder by material and equipment.

The situation was further complicated by occasional high winds, and also by the fact that the north end of the bridge had to be 30 feet higher than the south end, in order to meet a 7 per cent road grade.

Design of Bridge

The roadway of the structure is supported by two reinforced-concrete arch ribs, 4 feet square at the crown, 4 feet wide and 8 feet thick at the base. At either end of the arch ribs there are two main concrete pillars 6 x 9 feet at the base. These pillars are hollow, with walls 2 feet thick at the bottom, tapering to 15 inches at the top. Each pair of columns is joined by three 2 x 10-foot concrete beams between the base and top girder.

Two pairs of shorter towers at the south end and one pair at the north end assist in supporting the road deck. The roadway is 24 feet wide, with an 8-inch concrete slab, and a 3-foot walk with an ornamental steel railing on either side.

(*Concluded on page 37*)

A Gar-Bro concrete bucket pouring the deck of Big Tujunga Bridge.

The new Haiss 80W loader.

New Bucket Loader On Pneumatic Tires

The new Haiss Model 80W bucket loader, just announced by the Geo. Haiss Mfg. Co., 139th St. & Rider Ave., New York City, is a wheel-mounted counterpart of the Model 80 crawler-tread model. Its digging mechanism is the same and also its rated capacity of 3 to 5 cubic yards a minute in heavy-duty work.

The feature of the Model 80W is its pneumatic-tired mounting. Weight distribution has been carefully engineered so that the 9.00-20 single tires in front and dual tires of the same size in the rear all carry approximately equal loads. The 80W has a 7-foot wheelbase, with an 8-foot 10½-inch width over rubber in the rear and a 6-foot 9¼-inch tread width in front. The road speed is up to 5½ miles an hour, and two speeds are provided, both forward and reverse. The power crowding drive is geared for 18.6 feet per minute.

This heavy-duty model 80W is powered by a 55-hp standard gasoline engine. Motor-truck-type running gear is employed, with a standard Saginaw recirculating ball type automotive steering device. A pedal-operated traction brake, with latch, is provided. All controls are grouped at the operator's platform. Incorporated in the new 80W is a newly designed heavy-duty clutch and gear box, in which all shafts are mounted on Fafnir deep-grooved ball bearings of the external self-aligning type. The box is sealed, and all gears and clutches revolve in a bath of lubricant.

Further details on this new Haiss 80W loader may be secured direct from the manufacturer by referring to this item.

Free Publication Devoted To Lubricating Problems

The Sinclair Refining Co., Inc., 630 Fifth Ave., New York City, issues about six times a year a free publication entitled "The Service Factor" devoted to the solution of lubricating problems. Each issue is illustrated and given over completely to a specific field or type of equipment. For example, a recent copy covered "Specialized Lubricants for Defense Uses," another, "Charted Lubrication for Automotive and Industrial Engines and Power Units" and a third, "Charted Lubrication for Hydraulic Transmissions." The charts in each case list the make and model of equipment, mechanism to be lubricated, method of lubrication and the Sinclair recommendation for the type of lubricant to use. This publication should be very interesting and valuable to all contractors and highway department men during the national emergency when it is particularly important, due to the difficulty in securing replacements, that equipment be kept in good running order.

Those who wish to be added to the mailing list to receive copies of this publication regularly may do so by writing direct to the Sinclair Refining Co. and mentioning CONTRACTORS AND ENGINEERS MONTHLY.

Rawlplug Branch Manager

Kenneth M. Anderson has been placed in charge of the Rawlplug-Los Angeles Co., 2115 South San Pedro St., Los Angeles, Calif., a branch of the Rawlplug Co., New York City, manufacturer of expansion anchors.

Pointers on Planting From Road Engineer

Joint Efforts of Design Engineers and Landscape Architects Increase Safety, Reduce Maintenance

By W. V. BUCK, Senior Highway Engineer, Public Roads Administration

✦ THE employment of landscape architects to assist in the design and construction of our highways has increased rapidly in the past few years, and their contributions have greatly improved the appearance of the highways. The cooperative efforts of engineers and landscape architects have been constantly improved over the past eight or nine years, and real progress has been made in effecting roadside improvements.

In the beginning highway engineers did not like to see road funds going into what they called "pansy projects", and some landscape architects felt that they had not done their job unless they planted lots of trees and shrubs and generally fixed up the roadsides so that little space was left for grass and that space such that it could be mowed only by means of a hand sickle or a lawn mower.

The highway engineer envisages his roadway as a utility, the general components of the cross section being designed with definite purposes in mind. His contribution to the highways of the nation is too well known to need further description here, but we should like to discuss the parts of the design left to the landscape architect for completion.

Improved Design

The intersections of all slopes must be rounded. Ohio, for example, uses a short arc in rounding which perhaps might be described as minimum rounding. A rounding extending one-third the length of the slope is desirable, as it flattens the slope at its extremities, providing an area better suited to planting and a corresponding reduction in erosive action.

A 2-lane highway in Ohio, carrying traffic of major importance, generally has a paved surface 24 feet wide. The clear shoulder width on such a highway is usually 10 feet. If guard rail is needed, an extra 2 feet or more should be provided. The normal shoulder slope is at least 3 to 1, although it may be 4 to 1 or 5 to 1 in more level sections.

As the height of fill increases, there is a tendency on the part of the engineer to steepen slopes to reduce earth work quantities and keep costs down. With the steeper slopes it is necessary to use guard rail, which makes it necessary to widen the entire fill, generally 2 feet, for each line of guard rail.

There is now a tendency among the more analytical engineers to compare the cost of guard rail with the cost of flatter slopes and to build the flatter slopes wherever their cost does not exceed the cost of guard rail. Under such practice guard rail is not used on fills less than approximately 10 feet in height. Seeding such slopes to prevent erosion is the landscape architect's contribution to this phase of highway development. There may be some question as to the advisability of seeding slopes steeper than 3 to 1, but seeding is generally successful in Ohio on 2 to 1 slopes that are properly mulched.

From the standpoint of design, it is suggested that ditches should be wide enough and flat or shallow enough to permit adequate rounding of the intersection with the shoulder and backslope intersections.

Backslopes

The engineer must strive for a gentle backslope just as earnestly as he does for a flat shoulder-to-ditch slope. However, where the cuts are deep, there is a general tendency to steepen the backslope in order to reduce excavation quantities.

In places where, because of difficulty in obtaining right-of-way or for any other reason, it is necessary to use a steep slope, the landscape architect has an opportunity to assist materially in improving the final appearance of the highway by the use of his knowledge of planting to protect the slopes from erosion and in effecting a blending of all lines of the backslope.

Although the engineer, in designing backslopes, has technical information which has been developed by the soils engineer and uses this information as a guide in the design of the backslope, erosion may sometimes occur. These eroded areas must then have careful attention and treatment for a comprehensive roadside-improvement project which may be developed later.

In flat country the backslopes should be as flat, or flatter, than the shoulder slopes and may extend back of the right-of-way line, providing proper arrangements can be made with the landowner.

Medial Strips

In the design of 4-lane highways, the two pairs of lanes are now usually separated by a neutral area, either paved or grassed. Highway engineers prefer a minimum width of 30 feet between lanes. This offers an opportunity for shoulders sloping gently toward drainage outlets placed midway between the pairs of lanes. Generally it is desirable to have this area grassed and kept reasonably free from obstructions. There are points where judicious center planting is helpful in reducing the glare of headlights, particularly at curves. The landscape architect should be cautioned, however, against over-planting and the use of obstructive planting on the medial strip. The purpose of such planting should always be to facilitate proper and safe driving.

Planting for Snow-Drift Control

In regions of snowfall, all grade lines and slope treatment should be planned to avoid snowdrifts by keeping the grade line above the adjacent fields and by the use of long flat slopes that may be as gentle as 10 to 1. In the selection and placing of plantings, the landscape architect must recognize requirements as to the control and removal of snow. Wisconsin has done some experimentation with plantings to

(*Concluded on page* 41)

The new General Supercrane.

Rubber-Tired Crane Self-Propelled Unit

The improved Supercrane, made by the General Excavator Co., Marion, Ohio, is a pneumatic-tired self-propelled unit, operated by one man and one motor, with a safe lifting capacity of 15 tons. Although built primarily for crane service, it can be equipped as a clamshell, dragline, pile driver or pull shovel. This new model has a stronger frame, hydraulic steering and brakes, enclosed transmission and differential, and increased mobility, according to the manufacturer.

The upper body is of typical General design. Power is taken from the motor to the operating machinery by a Twin-Disc power take-off clutch. The swing and travel motions are controlled by two Twin-Disc friction clutches. A special brake is mounted on the lower end of the vertical intermediate shaft underneath the deck, which acts as a swing brake when swinging, and as an auxiliary or parking brake when propelling. An exclusive General feature which is standard on the Supercrane is a precision hoist brake, mounted on the intermediate shaft, and connected to the hoist drum by chain drive. This brake is said to give three times the braking power of the normal drum brake, and also permits backing the load down through the gears when the engine clutch is disconnected, or makes possible driving the drum backward under power. The Supercrane has an independent boom hoist, of the cut steel worm and gear type, with a band-type safety brake, entirely independent of the swing and travel motions.

The Supercrane may be either the single or tandem-axle type. The tandem axles have four-way oscillation, giving maximum traction. All rear wheels are chain driven. Transmission in the wheel mount is the two-speed heavy-duty type, with gears enclosed and running in oil. The differential is the Timken Detroit bevel gear type, enclosed and running in oil. In addition to the two travel speeds given through the transmission, two additional speeds are available through speed change gears mounted on the deck.

Further details on the Supercrane for all types of material-handling jobs may be secured by interested contractors and engineers direct from the manufacturer.

New Air-Tool Hose

A specially designed light-weight air hose for pneumatic riveters, chippers and other air tools has been announced by the United States Rubber Co., 1230 Sixth Ave., New York City. This new product, which was designed particularly to speed up ship-building and ship repair, weighs only 20 pounds per 100 feet and is said to cut in half the load to be carried by workers handling pneumatic tools, thus conserving their strength and energy while permitting faster work. This reduction in weight likewise increases flexibility, an important factor when working in tight quarters.

It is stated that strength has not been sacrificed by lightening the new hose. It is made with a 1/16-inch thick oil-resisting rubber tube, one ply of specially braided light-weight yarn, and a 1/16-inch abrasion-resisting cover. Its burst value is said to be nine times the average operating pressures encountered in this service.

A New Treatment for Diesel Cooling Systems

A new organic water treatment for the circulatory cooling systems in diesel engines has been developed by the Water Treatment Co. of America, 1159 Hodgkiss Street, Pittsburgh, Penna. This treatment, which consists only of a single liquid addition to the cooling water, is claimed to remove all scale and rust from the cooling system and to inhibit further such formations. The formula, Bearite 22-A, is made up of a number of especially developed vegetable substances which are entirely harmless to paint, rubber gaskets, metal, etc., because they react only in the presence of alkaline water, rust and scale deposits, according to the manufacturer.

A data sheet describing Bearite and its method of use may be secured by interested contractors and engineers direct from the Water Treatment Co. of America or from CONTRACTORS AND ENGINEERS MONTHLY.

Army Camp Finished On Time, Despite Mud

(*Continued from page 9*)

Ford Leonard Wood site the native oak and walnut trees were left standing in areas not directly covered by buildings.

Other excavation in the camp site proper consisted of utility and sewer mains and foundation structure excavation for the buildings, the water pumping station and the sewage disposal plant. This was handled by three Bucyrus-Erie 10-B trench excavators, two Model 31 Parsons trench diggers and two Lima Paymaster trench hoes. In general, the muddier overburden had already been stripped away by the bulldozers so that mats were not needed.

Working on the Railroad

The business of building a railroad became more and more urgent. Time, the all-important element, was creeping up. On January 26, McCune and Tom Knobel, KNWL's Excavation Superintendent, decided to go ahead, even though it was raining and sleeting without letup. Halfway through the dull, gray January morning McCune gave Knobel the order to go ahead, an order which set the unprecedented number of 3,600 pieces of equipment to work at once.

The fleet of International and Caterpillar tractors was brought in to strip muddy clay from drilling areas in the railroad right-of-way. Three hundred light towers, enough to light a fair sized city, were scattered through the Ozark hills. Working night and day, the bulldozers gouged muddy and frozen ground loose, leaving the flat sedimentary limestone benches exposed and easily available for drilling.

Five blast-hole drills, carrying 4-inch drill bits on the end of their tool string, were put to work drilling holes through the limestone. It was a discouraging mess. Holes were scarcely started when ground water from the abnormally wet season began to seep in. The rock, although it laid in a flat plane, was seamy and hard to drill. Tom Knobel kept a steady stream of sharpened drill bits coming in, however, and the machines kept on working. That was the important thing, for every hour each drill put in meant another 6 feet of hole put down. Holes were carried to grade, and sometimes a foot or two below in the harder rock.

In a few days the results of their efforts began to tell. Loading crews were put to work. Ground water and rain made the use of bag powder virtually prohibitive, so more than a pound of 40 per cent Hercules and Atlas gelatin was loaded into the holes for each cubic

R. F. McCune, General Superintendent for KNWL Contractors at Fort Leonard Wood in Missouri.

yard of stone to be broken out. While this is more than is generally used, it must be borne in mind that the blasted rock had to be loaded into dippers as small as 1 cubic yard. Knobel felt, therefore, that by getting thorough breakage which practically eliminated secondary shooting and left no high grade, the use of the excess amount of explosives was more than justified. About 350,000 pounds were used in less than 2 months.

With the first big blast came the excavating and hauling machines to start their part of the work. So many units were engaged that it would be impossible to name them in this space. Almost every conceivable piece and make of earth-moving equipment was there. Several midwestern contractors were hired intact, bringing in all their machines and the key men who formed the nucleus of their organizations. The 27-mile piece of railroad was divided up into a number of separate excavation projects and to each was assigned a whole organization and group of machines to work out a "balance point".

The result was magnificent to watch. Twenty Allis-Chalmers Speed-Aces roared down the rock fills, 15 Koehring Dumptors worked side by side with 3 Linn trucks and 10 Hug units, 35 gray Euclids from 8 to 18 cubic yards in size churned the mud with their rubber tires as they rolled away from the loading units. To keep this immense fleet of hauling units busy required many shovels. A Bucyrus-Erie 44-B, 2 Bucyrus-Erie 20-B's, a Lorain 79, two 2½-cubic yard Limas, a Marion Type 392 and a 2½-cubic yard P & H machine all joined together to load out the broken rock.

"Keep 'Em Moving"

It can easily be seen how comprehensive and huge this excavation job must have been. So many pieces of equipment working at once could easily have clogged up and bottlenecked, had the excavation program not been carefully thought out and planned in advance. The tie-up of one shovel meant that ten or twelve dependent hauling units were also shut down.

"We simply can't afford to have extensive breakdowns, Tom," McCune had said to Knobel that January day. "We've got to keep these machines digging."

So Knobel kept them digging. During the peak of the job, when 3,600 pieces of equipment were scattered over the Ozark hills, 180 mechanics were employed to service and make running repairs to the machines. Probably no Pan-American Airways Clipper roaring into LaGuardia Airport from the Azores ever received more loving mechanical care than did the shovels, cranes and tractors at Fort Leonard Wood. Minor things, such as the replacement of a worn cable or hydraulic hose, were always taken care of during a lunch hour before anything serious could happen.

Moving nearly 1,000 cubic yards of stone per working hour, the machines kept doggedly at their task day after day. When completed areas were no longer required for hauling to adjacent work, track crews started laying rails and ties on a bed of finely pulverized rock ballast. In order to furnish this ballast a big crusher was erected. Native limestone was broken up in the crusher and hauled out to the railroad by spare trucks and other machines which were

(*Concluded on next page*)

All Types of Work At Fort Leonard Wood

(*Continued from preceding page*)

finished with their part of the excavation.

Pile drivers, mounted on railroad cars, were sent in to build trestles to carry the new railroad over the Big Piney River and over a few of the other streams under the railroad. Creosoted cypress and pine piling were used in the trestles which formed the approaches to the streams. Concrete piers, streamlined in the direction of channel flow, were poured to carry the trains directly over the Big Piney.

On April 19, not 3 months from the starting date, the first locomotive with a trainload of supplies for Fort Leonard Wood chugged down the finished line. April 19 was appropriate and well timed. On April 19, 1775, another group of fighting Americans, working together with a purpose, did another defense job back at Lexington and Concord, Massachusetts, on which a gentleman named Paul Revere gave the start order. The completion of this insurmountable task, well nigh impossible in such a limited period of time, has no more appropriate parallel than is recalled by that other feat back in the days of the Revolution.

Other Work

While the railroad work was being pushed, the rest of the camp construction was also being rushed. Ford Leonard Wood is entirely new; there were no other buildings previously built by other agencies of the Army. A systematic program was outlined for the building construction after the site was graded and haul roads established. A schedule was set up calling for the completion of 30 buildings per day. The progress of each building was charted by steps, and when one crew finished with its part of the work another crew moved in to perform whatever it had to do.

Working in this manner, there was no delay. For instance, when the foundation crew had finished the fine grading and form work for the concrete, usually the concrete crew was already on the way. The nearest comparison to that building program is an assembly line. The barracks buildings were virtually rolled out over this assembly line of labor. Even before the job was completed several trainloads of troops arrived.

Erection of the buildings started in one corner of the reservation, continued in an orderly sequence designed to complete everything as the job progressed, and finally wound up with all the crews closing in on the last corner of the reservation. Structures such as the big pumping plant and the 1½-acre laundry building were started in advance and completed by the time the building construction had passed that location.

One of the main reasons why the site of Fort Leonard Wood was changed to the Missouri location was because the Chief of Engineers had questioned the adequacy of the water supply in Iowa. Fort Wood is only a few miles distant from the Big Piney River, a clear, cold stream with a flow of 250 cubic feet of water per second even in times of drought. All water lines had to be laid below the frost level, for freezing weather is not uncommon to Missouri winters. A huge storage reservoir was constructed completely underground to furnish the water for camp use. The finished plant will filter 9,000,000 gallons of Big Piney water daily.

Vast Project Ran Smoothly

When the job was at its peak, 32,500 men were on the company payroll. The checks for one week, if they could have been laid end to end before the men grabbed them, would have reached nearly 10 miles. One week's payroll then totaled in excess of $1,300,000.

Completion of the 7th Corps Area training center will serve three major purposes. It will provide a training center for engineers, assisting the Engineer School at Fort Belvoir, Virginia, in that capacity; it will make possible the centralization in one location of the entire 6th Division which for years has been well scattered all over the country, and finally, it will be a center for training National Guard field artillery units.

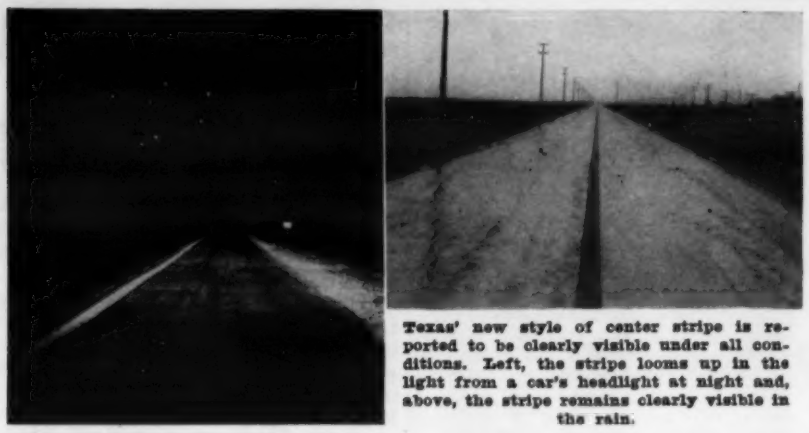
A Lima trench hoe roughs out a sewer line at Fort Leonard Wood. Note the many trees left standing to landscape the camp site.

No labor trouble or strikes occurred at any time during the job. For this, and for the construction of the camp itself under the worst difficulties, the entire state of Missouri seems justly proud in its editorial writings. And the construction industry may also take pride in the fact that efficient well-organized contractors took on an almost Herculean task and completed it on time, once again making their contribution to the welfare of this country.

Neumiller Now President Of Caterpillar Tractor

Louis B. Neumiller, who began his association with the Caterpillar Tractor Co. 26 years ago as a stenographer and blueprint clerk in the engineering department, has been elected President of that company. Mr. Neumiller succeeds B. C. Heacock, President since 1930, who becomes Chairman of the Executive Committee, and who is at present serving as a special assistant to Under-Secretary of War Robert Patterson.

Mr. Neumiller's advance in the company has been outstanding, having served as Parts Manager, General Service Manager, Sales Manager, and Vice President.



Texas' new style of center stripe is reported to be clearly visible under all conditions. Left, the stripe looms up in the light from a car's headlight at night and, above, the stripe remains clearly visible in the rain.

New Center Stripe On Texas Highways

Traffic Stripe Made of Asphalt and Stone Is Proving More Efficient And Economical

(*Photo on page* 44)

✦ THE development of a new type of asphalt and stone center traffic stripe by the Texas Highway Department has provided a much better traffic-dividing line on state highways and promises a considerable saving in the cost of this important traffic-safety feature in Texas.

Among the features of this new traffic stripe is that it is non-skid, its visibility is said to be greater in both wet and dry weather, day or night, showing up distinctly for long distances. It is non-glaring, either in bright sunlight or in the light from headlights of approaching cars; it is semi-permanent and it is expected that it will outwear paint or plain asphalt stripes. On asphalt, seal coat and other types of paving it is said that it will last practically as long as the pavement itself.

How It Is Made

This new type of stripe is made by spreading and rolling small stone into an asphalt stripe, building up the stripe about one-fourth inch, and is made in contrast to the pavement, in color and elevation. On concrete and gray asphalt pavements, small black stone is spread into the asphalt stripe and on a black or dark-surfaced pavement white rock is used.

District No. 16 of the Texas Highway Department, George B. Finley, District Engineer, has striped most of the highway in that district with the new stripe and has designed and built an outfit for

(*Concluded on page* 43)

Chain Belt Celebrates Its 50th Anniversary

On September 9, 1941, the Chain Belt Co., 1666 W. Bruce St., Milwaukee, Wis., celebrated its 50th Anniversary. Founded in 1891 by C. W. Levalley for the purpose of producing an improved type of detachable chain, then used largely on agricultural machinery, it has since expanded its activities so that today it has plants at Milwaukee and West Milwaukee, Wis., Springfield, and Worcester, Mass., and is recognized as one of the largest producers of chain belts, construction machinery, elevating and conveying equipment and other related products. Its first concrete mixer was built in 1908, road pavers equipped with steam power were added in 1912, followed by centrifugal water pumps, Moto-Mixers and the Rex Pumpcrete in 1933. In 1939 the Baldwin-Duckworth Chain Corp. was merged with Chain Belt to add finished roller chain belts and automotive timing chain belts to the line.

The interesting story of the growth of this company is told in the Anniversary issue of *The Rex World* which those interested may obtain by writing direct to Chain Belt and mentioning this item.

Shovels and Cranes Play Part on Defense Projects

Among the many defense construction projects on which Michigan shovels and cranes are playing their part are the Southwest Proving Grounds, at Hope, Arkansas; the Weldon Springs Ordnance Plant, Weldon Springs, Mo.; the Jefferson Proving Grounds at Madison, Ind.; the Ravenna Ordnance Plant, Ravenna, Ohio; and the Powder Plant at Radford, Va.

Probably of more dramatic interest, the Michigan Power Shovel Co. reports, are the number of Michigans operating in the British Isles where they are used for demolition work, filling in bomb craters, and a wide variety of emergency work where the mobile Michigan truck-type unit has proved particularly serviceable.

Placing Earth Fill In Surry Mtn. Dam

(*Continued from page 17*)

original ground surface. Adjacent to the core section, both upstream and downstream, is a random impervious layer, with the outer slopes 1 on 1½. The upstream section of random impervious fill contains the cofferdam as its toe. Outside the random impervious fill is pervious fill placed 1 on 2.083 from the top of the dam, Elev. 568.0, down to the elevation of the spillway crest, Elev. 550.0; from that point to Elev. 520.0 the slope is 1 on 3, and below that 1 on 5. Both upstream and downstream the dam is protected by a 3-foot dumped rock riprap on a 1-foot gravel bed. Upstream is a rock toe in a trench 7 feet wide at the bottom, while downstream the dumped rock toe ends in a trench 10 feet wide with 1 on 1 slopes to ground level, and a 1-foot gravel bed between the ground surface and the dumped rock. A 1-foot 6-inch select gravel filter overlies the dumped rock toe between it and the pervious downstream section.

The spillway, a side channel, excavated through the granite of the right abutment, is a 107,000-cubic yard cut. The modified Boston horseshoe-section diversion tunnel and rectangular gate shaft, below and to the east of the spillway, represent an additional 3,500 cubic yards of excavation through this granite spur.

Clearing and Grubbing

The contractor started work in August, 1939, clearing, grubbing and stripping the site and excavating a cut-off trench which runs lengthwise and centrally beneath the core of the dam. Meanwhile excavation of the tunnel and gate shaft was being carried on under a subcontract.

A 12-yard and an 18-yard LeTourneau scraper pulled by D8 Caterpillar tractors were used to strip the first 46,000 cubic yards, the top soil being saved for later landscaping, and the rest of the excavated material wasted. An additional 5-foot depth of stripping, too full of logs and boulders for the scrapers to handle, was excavated with two Bucyrus-Erie units, one a 1½-yard shovel and the other a 1½-yard dragline, and loaded out into 5-yard Sterling trucks with Heil bodies. This material was also wasted. The rock from tunnel and gate shaft was scraped out with a Sullivan double-drum Lohite loader, dumped into Koppel 1½-yard side-dump cars and some of it later used on the rock facing of the dam.

The Borrow Areas

The six-borrow areas, referred to as A, B, C, D, E, and F, are located two adjacent to the dam site on either side of the river, and borrow areas D and F at some distance upstream. Borrow areas A and E on the left bank are mixed deposits of sand, silt, and gravel, with the upper 10 feet of the formation at borrow area A a loose to moderately compact material and the lower portion, compact, containing considerable fines. Borrow area B, on the right bank farthest downstream, adjacent to the highway to Keene, N.H., contains uniform silt deposits overlaid by sand and gravel and underlaid by mixed sand, silt and gravel but was not used. Borrow area C, just upstream of the dam site on the right bank, and also adjacent to the highway, is composed of sand and gravel deposited to an average depth of about 15 feet. The distant borrow areas, D and F, are large sand and gravel deposits.

Placing Impervious Fill

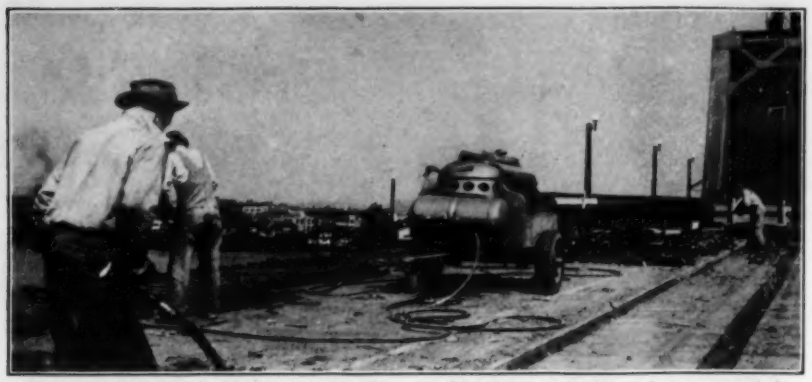
Select impervious material is loaded by Thew-Lorain L-80 1¾-yard diesel-powered shovels to LeTourneau 12 and 18-yard scrapers pulled by D8 tractors and to 28-yard Tournatrailers, also pulled by D8 tractors. These units dumped and spread the material on the embankment, operating an average haul of 1,500 feet each way.

A D8 Caterpillar and LeTourneau bulldozer with two LeTourneau sheepsfoot rollers towed behind in tandem at Surry Mountain Dam.

The select impervious material spread on the embankment is tamped with two LeTourneau sheepsfoot rollers, pulled in tandem by a D8 Caterpillar tractor on which a LeTourneau bulldozer is mounted.

Some difficulty was encountered at first from breakage of standard cables on the cable-controlled scrapers and bulldozers, because of the bending stresses, the sudden heavy loading and the highly abrasive conditions. Believing that preformed wire rope, since it is relieved of internal torsional stresses during its manufacture, would offer higher fatigue resistance, the contractor purchased an

(*Concluded on page 36*)



The first equipment on the job for the new $4,000,000 waterfront improvement in Portland, Ore., were an Ingersoll-Rand Mobil-Air compressor and three I-R pavement breakers to remove pavement for the new approach to the Hawthorne Bridge.

First Contracts for Portland Improvement

(*Continued from page* 15)

Bridge with a series of ramps, eliminating cross traffic at grade. This bridge is at the present time not carrying nearly its full capacity. At the east end of this bridge north-bound traffic will turn to the right and pass under Oregon Street. Here, on the east side of the river, Harbor Drive will then parallel the river and pass under the Broadway Bridge approach, which is the last bridge seen at the top of the drawing. It will make contact with north-bound traffic crossing the bridge through a system of ramps and accelerating lanes.

It will be seen that the situation along the river front lends itself readily to the building of a limited-access rapid-transit facility without the expense that an elevated highway would entail. The river is a natural barrier which prevents access to the arterial highway from the river side. The proposed highway passes under all bridge heads, eliminating cross streams of traffic at grade. It will, however, be necessary to block and control access along the west side.

In order to realize the full advantage of this condition, the plan contemplates the purchase of all property between Front Avenue and the sea wall and the construction of the central strip of parking. No buildings which will require access will occupy this ground, with the exception of the present Public Market building, which is seen between the first two bridge heads. Had the project been a mere widening of Front Avenue, property would have been developed on both sides with resultant cross streams of traffic which would have to a large extent defeated the purpose.

Front Avenue itself will be widened to provide six lanes. This will form an inner or service drive, permitting traffic from the north and south, which has business in the city, to turn off Harbor Drive at convenient points and shuttle back and forth along the service drive to gain entrance to that portion of the business district desired.

First Contract

By June 15, 1941, two of the contracts had been let and work was actively underway. The first contract, on May 9, for 112 feet of reinforced concrete viaduct to make a new approach to the Hawthorne Bridge was awarded to Lindstrom Bros. of Portland, on their bid of $31,120. On May 22, the second contract was awarded to the Edlefsen-Weygandt Co. for that portion of the improvement between Clay and Washington Streets. This includes grading and paving 0.5 mile and building concrete walks, stairways, walls and traffic islands. The amount of this contract is $223,790.

To Lindstrom Bros. fell the honor of doing the first strokes of work on the long-contemplated improvement. Under Emil Lindstrom as Superintendent, they moved in on the present approach to the bridge and began tearing up the old asphalt pavement. The first mechanical equipment on the job was an I-R Model K-105 portable compressor, driven by a Model 130-GS Waukesha gasoline engine. This supplied the air pressure of 100 pounds for the operation of three I-R 63 pavement breakers. The equipment was later supplemented by a Chicago Pneumatic portable compressor.

The problem here was to tear out the trestle piling supporting the old approach, simultaneously excavating and building forms for the new concrete structure, and maintaining traffic on one half of the bridge at the same time. A longitudinal construction joint and temporary pipe rail will divide the two halves. In the approach there are one 20-foot shore span and two 43-foot main spans under which the highway traffic will eventually pass.

New Bulletin Describes Power Shovel Dippers

Amsco power shovel dippers and dipper parts, including the renewable-lip dipper, Amsco manganese steel dipper teeth, fronts, bails, doors and other parts, are described and illustrated in a new bulletin just issued by the American Manganese Steel Div., American Brake Shoe & Foundry Co., Chicago Heights, Ill. The latest designs of renewable-lip dippers for all types of services are illustrated and their features described, and the booklet also contains a discussion of manganese steel and the reasons for its use in construction equipment subjected to heavy duty and severe wear.

Copies of this bulletin, No. 641-D, may be secured by interested contractors and engineers direct from the manufacturer by mentioning this item.

The new Blaw-Knox Model XB finishing machine.

Gas-Driven Finisher Has Improved Features

A number of new features designed to provide greater flexibility of operation has been introduced in the latest model of the Blaw-Knox gasoline-driven finishing machine. One of these features is the provision for six traction and four screed speeds, which variety of speeds will accommodate any texture of concrete or any type of paving work, according to the manufacturer, the Blaw-Knox Co., Pittsburgh, Penna. On very harsh concrete, for example, it is possible to operate the traction at slow speed and the screeds at one of the higher speeds.

This new finisher is equipped with power-operated hydraulic screed lifts. A short lever raises or lowers the screeds, and the same type of hydraulic lift is applied to the vibrator if equipped with one. The screed speeds on the narrow machines are 56, 69, 75 and 92 strokes a minute while on the wider machines the screeds operate 48, 60, 63 and 79 strokes a minute, with the length of the screed adjustable from 6 to 11 inches.

An automotive type of transmission controls all functions, including traction, screed operation, belter, tamper or vibrator. The traction wheels have removable rims to facilitate the change from one type of work to another, and there is special wheel equipment for multiple-lane construction of airport runways and aprons. Also included in this new model is an entirely new design of spring steel wheel cleaners which extend to the horizontal center line of the wheels where they can do a more thorough job of cleaning. Retained in the new model are the spring shock absorbers for both front and rear screeds to reduce side thrust on the road forms.

Transportation of the finisher from job to job is conveniently handled by the novel Blaw-Knox moving truck which is fastened to the top of the transverse frame of the finisher without any dismantling of the finisher. Other attachments which are available include a quick adjustable front screed for rapid transition from crown to flat and back to crown, a tamper, a vibratory attachment, a belter, a quick adjustable strike-off plate, a hinged strike-off plate, a curve widening device, and special attachments for asphalt paving.

Nearly 5 Miles of Belt Used at Naval Air Base

An order for cord conveyor belting totaling 25,600 linear feet, or nearly 5 miles, for use in defense construction work at Honolulu, T. H., has been announced by the B. F. Goodrich Co., Akron, Ohio, for Contractors, Pacific Naval Air Bases. This conveyor belting will be used for two purposes, to remove dirt and rocks from the excavation for an underground fuel storage system, and to handle this material either to the waste dump or to a large aggregate plant which will remove the dirt and sort the rock in different sizes for use as aggregate in the concrete.

Because this material will be loaded by a metal pan feeder onto the conveyor system just as it is shot, without any preliminary sizing, the belting system had to be designed to take a large amount of abuse. Minus 28-inch material will be handled on 48-inch wide belting which in turn will discharge into a primary crusher. The material coming from this crusher will be minus 9-inch and will be conveyod on 36-inch wide belting. The conveying idlers and machinery are being furnished by the Stephens-Adamson Mfg. Co., Los Angeles, Calif.

The cord conveyor belt which B. F. Goodrich is using on this installation follows a new principle in conveyor belt construction, utilizing the cord principles of the modern automobile tire, and consists of 4,000 linear feet of 48-inch 10-ply belt; 15,800 linear feet of 36-inch 6-ply; 1,500 feet of 30-inch 5-ply; and 4,300 feet of 24-inch 4-ply. All of these belts will be made endless by vulcanized splicing on the job.

Catalog on Steam Cleaner

A new catalog has recently been released by the Homestead Valve Mfg. Co., Inc., Coraopolis, Penna., devoted to its Hypressure Jenny steam cleaners and their many applications in the road-building, construction, automotive and industrial fields. Many typical uses are pictured and there is information to aid in the selection of the right model Hypressure Jenny to handle the broadest range of each owner's cleaning jobs. The principle of operation is explained and specifications for the various models are given.

Copies of this illustrated catalog may be obtained direct from the manufacturer by mentioning this item.

A Linn crawler truck receiving a load from a 37-B Bucyrus-Erie shovel at Surry Mountain Dam.

Variety of Hauling Units at Earth Dam

(*Continued from page* 33)

experimental 500-foot reel of 9/16-inch preformed by 6 x 19 IWRC cable. This preformed wire rope gave such satisfactory results, outlasting standard rope about 2 to 1, that the contractor now uses preformed wire rope on all cable-controlled equipment, incidentally pleasing the operators because it is easy to handle and resists kinking.

Random impervious fill, the material each side of the select impervious core, is obtained from different parts of the borrow pits than the select impervious fill but is excavated, loaded, hauled, dumped and spread in similar manner, the chief difference being in the dumping which requires that the coarser portions of the random impervious fill be placed towards the outside edge and the finer portions towards the select impervious core in order to effect a gradational transition from the impervious to the pervious sections.

Pervious Fill

Practically all of the pervious fill comes from borrow areas D and F, 1½ and 2½ miles, respectively, from the dam. Under a subcontract, Arthur Whitcomb, using a 20-B Bucyrus-Erie shovel and a Mead-Morrison shovel, loaded pervious fill into a fleet of International dump trucks which unloaded on the embankment.

These pits are also the sources of raw material for selected pervious fill which requires processing at Whitcomb's screening plant before delivery to the embankment. This plant removes fines to produce material which contains not more than 10 per cent, by weight, of material which will pass a No. 10 sieve. These by-product fines are used as pervious fill in the embankment, initially being loaded and hauled by scrapers. During the current construction season, they have been loaded by shovel and hauled by trucks.

In connection with the shovels used in excavating the material for pervious fill, Arthur Whitcomb reported as follows: "... I spent considerable time and money experimenting on various types and kinds of wire rope. I kept an accurate record of cost per working hour and also considered the kind of work the different machines were doing. As a result of my survey I finally decided on 6 x 19 wire rope preformed Lang lay. . . . In all cases I use a preformed cable. It has a longer life, is more flexible, is easier to handle, is less apt to kink, spools better, broken outer wires don't stick up, and it is flexible enough to allow me to use a wire rope center, which in some cases I could not do with a non-preformed cable."

Rock Facing

Outside the pervious fill of the embankment comes a bed of gravel 1 foot thick. This gravel, screened out in the screening plant, is hauled in Whitcomb's International dump trucks and carefully dumped in place. As in the case of the random impervious fill, the pervious sections are graded from the finer materials to the coarser materials near the outer faces of the embankment, this being the bed of gravel.

Rock facing for the upstream and downstream slopes of the dam is being obtained from the spillway cut through the granite of the west abutment. After blasting, it is loaded out with a 37-B Bucyrus-Erie shovel into Linn DUR-437 gas-powered 8-yard crawler dump trucks, Koehring W-55 gas-powered Dumptors and an Athey 15-yard crawler wagon towed by an Allis-Chalmers HD-14 diesel-powered tractor. Hauling is direct to the embankment, where the rock is dumped in a 3-foot layer and placed in position with a 303 Koehring crane, using a ¾-yard clamshell bucket, tongs, or chain sling and hooks, as occasion demands.

The specifications call for the 3-foot rock fill of the embankment to be 50 per cent ½-cubic foot to 1-cubic yard pieces of solid rock.

Equipment Selection

Here on one job are examples of the intelligent use of seven different types of hauling equipment.

The LeTourneau four-wheeled self-loading scrapers were selected for the excavation and controlled spreading of earth which is sufficiently loose, not too wet and sticky, and not too full of obstructions. The use of these scrapers permits even spreading of their loads without later bulldozing.

For shovel loading of huge volumes of material and for the shovel loading of the overburden, Tournatrailers are used, because they provide reasonably even spreading on the fill, although usually followed by bulldozing, and for the disposal of overburden because they are able to dump their loads safely over the edge of a cliff or bank.

For long-distance fast transportation to the fill of material excavated by shovels, light trucks were chosen. The use of oversize tires gives ample flotation on the loose fill where heavier trucks might have had trouble, particularly on the pervious material. This same type of truck is used for the fast long-distance transportation of material to the bins of the gravel screening plant where quick spotting, quick dumping and short turning radius are important.

Dumptors do service for handling the shovel-excavated rock where pieces are dipper size or larger. These units, handling one rock at a time, are sturdy, fast, can "turn on a dime" and dump over the edge of a fill, placing rock where needed.

The rugged bodies of Linn crawler trucks, their speed, big payloads, ability to negotiate rough going and to run close to the edge of the dump and place rock where needed, determined the selection of these units for handling big rocks, sometimes only two to a load.

For loading under the shovel handling rock and also occasionally for hauling borrow from the borrow areas to the embankment, the Athey crawler wagon is used because of its large capacity, rugged body and ability to negotiate rough terrain.

And lastly, heavy-duty Sterling dump trucks are used under the shovel and dragline for hauling stripped earth, rock and logs to spoil banks, and occasionally for hauling fill from borrow areas to the embankment. These units are sturdy and fast, although the contractor felt that they are not enough faster than the tractor-drawn Tournatrailers to make up for the extra capacity of the larger units.

All of which goes to prove that there is no single piece of hauling equipment which is entirely suitable for every sort of work and that the contractor who is selecting new equipment or is using available equipment is wise to make his choice on the basis of the particular kind of work to be done and the circumstances under which it is to be done, not expecting versatility from specialized equipment, or expecting generalized equipment to equal specialized equipment on specialized jobs.

Road Forms Are Firm Set on Damper Sand

Because of the character of the sandy subgrade, the Remus Construction Co., of Remus, Michigan, contractor for 8.209 miles of concrete paving on U. S. 131 south of Kalkaska, Mich., had a number of problems to solve.

In setting the forms for the 9-7-9-inch slab, the contractor used 9-inch forms on one side and 10-inch on the other, with the base buried 1 inch in the sand. The latter forms solved one of the problems as the 10-inch forms did not settle, while the 9-inch forms had to be repacked continuously under the base to maintain the grade because of the flow of the dry sand and the loss through vibration of the equipment. The additional inch of form permitted the base of the form being placed deep enough on damp sand to provide a stable foundation.

The character of the subgrade on this job, a loose sand with a comparatively small amount of coarse aggregate, made it necessary to use duck boards between the forms as well as along the shoulder.

Bridge Over Canyon For New County Road

(Continued from page 26)

The monolithic ribs rise 110 feet above their foundations on the canyon walls which at this point are 245 feet apart, and are 75 feet above the stream bed. The arches rest on footings 15 feet deep in the rock. The ends of the approach span girders are hinged to the bridge abutments with two bearings resting on lead cushions. Expansion rockers are placed at the top of the two main concrete pillars over 100 feet high. Nearly 5 tons of annealed steel was used in fabricating these rockers.

Construction

There was some question whether to use steel or wood trusses for supporting the concrete forms. Steel has a higher salvage value than wood and the former would have been no more expensive, but wood was chosen because making the connections between steel trusses and wood towers would have been difficult and expensive. As it worked out, the price of lumber rose so much while the bridge was being built that the falsework lumber was sold afterwards for nearly as much as it cost.

All falsework and bridge material was handled by a 1½-inch steel cable strung over the center line of the bridge between towers 800 feet apart. The head tower was 90 feet high and the tail tower 55 feet. Power for handling the material was furnished by an old-style vertical-boiler steam engine. During the early part of the work, a cable car transported workers across the canyon.

Four 90-foot counter-braced Howe-type trusses were built for the falsework. The bottom chords were 12 x 14 inches and the top chords 12 x 12 inches, capable of withstanding a 75,000-pound stress. The trusses were tied together with double 1⅛-inch tension rods. The two trusses were placed in position together and jacked into place. Then the middle trusses were lowered into place and all four bolted together. Structural steel was used extensively at joints to minimize deflection as the load over the trusses increased. Some of the gusset plates and butt blocks were welded into position before the trusses were fabricated.

The trusses, two underneath each arch rib, were supported by wood towers 170 feet high. Tower posts rested on 2½-foot concrete footings. All tower units were braced vertically and horizontally, and cables anchored to the canyon walls held the falsework firmly in place. The forms for the lower part of the arch were supported by four 52-foot and four 48-foot trusses between the wood towers and the canyon walls. These trusses were designed and built by the Arch Rib Truss Co. of Los Angeles, after the plan had been checked by Sam R. Kennedy, Bridge Engineer for the Los Angeles County Road Department.

The lumber was cut at the mill, bolted together on the job, and lowered into place from the overhead cable. Each tower section weighed about 4 tons and was made of 10 x 10 posts held in position by 3 x 12 ties and braces.

About 250,000 feet of lumber was used, furnished by the E. K. Wood Lumber Co. of Los Angeles. It is interesting to note that the falsework was designed so economically by Laurence J. Waller, Los Angeles structural engineer, in collaboration with Mr. Kennedy, County Engineer, that the amount of lumber used was 53,000 feet less than the original estimate which was furnished to the contractor.

Concreting

The aggregate, consisting of sand, pea gravel and 1½-inch rock, was furnished by John F. Gregg of Los Angeles. Gar-Bro material carts, pushed over a platform scale to weigh each batch, supplied the 1-yard MultiFoote concrete mixer. The concrete was delivered to a 1-yard Gar-Bro bottom-dump bucket handled by the cable hoist which lowered it into position for pouring.

The Big Tujunga Bridge nearing completion.

About 3,600 yards of concrete, 4,700 cubic yards of aggregate, 240 tons of reinforcing steel furnished by the Ceco Steel Products Co., 9,215 pounds of annealed steel, and 860 feet of steel railing were required for the structure.

Personnel

The work was started under George W. Jones as County Road Commissioner for Los Angeles County and completed under O. F. Cooley as Road Commissioner; Sam R. Kennedy is Bridge Engineer and N. E. Vasquez and William Olsen, Resident Engineers on this job. For the contractor, Person & Hollingsworth of Alhambra, F. X. Bruyere was Superintendent.

New Reo Branch Mgrs.

Reo Motors, Inc., Lansing, Mich., announced recently the appointment of O. V. Chapman as Manager of its Dallas Branch, and also the return of Herman Dorn to his former position as Manager of the Milwaukee Branch, after temporary management of the Dallas Branch for the past few months.

Want any information on equipment? Write the Editor.

C. & E. M. Photo
The exterior of the Stearns County repair shop at St. Cloud, Minn.

Garage and Shop of Stearns County, Minn.

(*Continued from page 2*)

A clockwise trip around the garage, starting at the left of the front door, shows first a 35-foot work bench made with a heavy timber at the back and a 12-inch channel at the front to take the wear. Lock cabinets over each bench are provided for tools, and bins below for larger tools and parts. A small oil-fired furnace is used in place of a blacksmith forge, but the good old anvil is still in evidence. At the end of the garage are two movable benches which can be placed near any truck or piece of equipment on which the two mechanics who are regularly employed at the garage may be working at the time.

The mechanics have mounted a Lincoln electric arc welder on a four-wheel trailer with a Ford V-8 engine for both shop and field service. A Marquette portable acetylene generator carrying an oxygen tank on the same portable frame is equipped with Rego regulators and tips. At the back of the garage one section is used for the open storage of bags of calcium chloride and grader blades. A novel installation is a special high-speed hot-air blower which is used for thawing out trucks and snow plows which come into the garage during extremely low temperatures. It is impossible for mechanics to work on them or even make adjustments when they are coated with a film of ice and caked with snow. This blower thaws them out in a few minutes and even dries them off so that there is no delay in repairs. A 550-gallon fuel-oil tank mounted on a trailer is kept in the garage to supply the diesel equipment and can be pulled out on the road behind a truck whenever considerable equipment is working in one place.

Another 35-foot workbench like the one at the front of the building is located at the back. The ceiling is covered with Celotex below the roof trusses to conserve heat and mounted on the trusses are two monorails, one running along the front bench and across the end of the garage and the other running the length of the workbench at the back. At the right of the front door is a Weaver twin-post 12-ton hydraulic lift which makes it possible to raise the heaviest trucks and graders clear of the floor for quick repairs on the underbody parts. Even though a considerable number of windows were bricked in when the county took over the building, there is still plenty of natural light and the ceiling is studded with large high-power incandescent lights giving a uniform light in winter and when work is done after dark.

At the right end of the garage as one enters at the front is a sign-painting shop where all county signs are prepared; back of this is the office with the parts room leading from it; and between the office and the sign room a lavatory and shower bath.

In the mezzanine above the boiler room, office and sign shop is a well-equipped soils laboratory where analyses are made to aid the stabilization program which the county has engaged in this year. The laboratory is equipped with running water, electric hot plates and an oven, and four sets of scales of various types for weighing samples. Over the sign shop are a number of cabinets for storing old County Highway Department office records.

Organization and Financing

The Board of County Commissioners, five in number, appoint the County Highway Engineer, the first appointment being for one year and then for a two-year term thereafter. The present County Highway Engineer, John S. Schmit, is now serving his first two-year term as Stearns County Highway Engineer, having held the corresponding office in Kittson County for three and one-half years and prior to that was Assistant County Highway Engineer in Polk County, Minnesota, for six years and for eight years before that served in various capacities in Polk County.

The monies for county highway work in 1941 included $115,000 from the real estate tax, $119,000 from the state gas tax and $40,000 from the levy of 1 mill for state-aid roads. This is the last year of this 1-mill tax in Minnesota as it is being replaced by taking an additional $2,000,000 from the state gas tax for allocation to counties.

The total value of warrants issued in 1940 was $384,091.94, of which $63,826.17 was for maintenance, $199,486.91 for construction, and the balance for the purchase of equipment, its maintenance, engineering and other overhead.

New Bulletin Describes Convertible Excavator

A new bulletin just published by the Harnischfeger Corp., Milwaukee, Wis., describes in detail the numerous special features of the P & H Model 150 ½-yard excavator. Large clear photographic illustrations depict the P & H hydraulic control and the manner in which simple rolled alloy steel attachments permit easy changeover for shovel, clamshell, crane, dragline, trench hoe, skimmer scoop or pile driver. Information is also given on the Model 150's rolled steel construction, tractor-type crawlers, 3-speed transmission, and other features.

Copies of this Bulletin X19-1 may be obtained by writing direct to the Harnischfeger Corp. and mentioning this item.

Skidproofing Icy Roads

This is the title of a bulletin recently released by the Calcium Chloride Association, 4145 Penobscot Building, Detroit, Michigan, to aid state and county highway engineers in solving "the ice problem." According to the Association, ice is an emergency requirng emergency measures. Delays cost money and may cost lives. Calcium-chloride-treated grits act very quickly, each particle beginning to anchor itself in the ice as soon as applied. Further, wind and traffic do not sweep the abrasives off the road, nor do the particles tend to skid under wheels. Calcium-chloride-treated grits kept in rain-capped stockpiles remain loose and unfrozen until such time as they are needed and will be effective at 30, 40, or even 50 degrees below zero.

Copies of this informative bulletin may be obtained by writing direct to the Association and mentioning this item.

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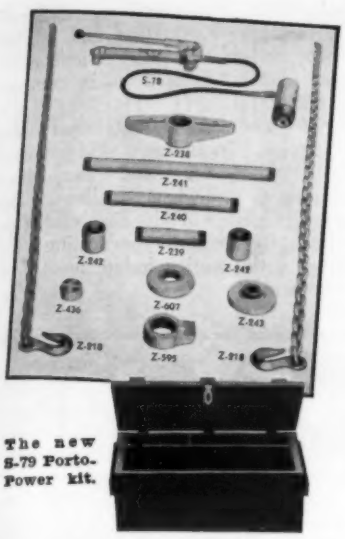
(New Address)

Name_____



The new S-79 Porto-Power kit.

Garage and Shop Service Equipment

A complete assortment of Blackhawk 20-ton Porto-Power hydraulic service equipment is now available in a compact portable container. In addition to the remotely controlled jack and attachments for pushing and pulling in all directions, this new S-79 kit has new attachments which adapt the jack to lifting from a low height of 3½ inches to a top height of 8½ inches.

This assortment has many uses in the garages and shops of contractors and of state and county highway departments for pulling gears and pulleys, lifting and pushing, toe-lifting in moving machinery, and other maintenance and production operations.

Complete information on this S-79 Porto-Power kit may be secured by interested contractors and state and county highway engineers direct from the Blackhawk Mfg. Co., 5325 W. Rogers St., Milwaukee, Wis. In addition, the manufacturer will be glad to send free blueprints showing how a press can be made economically for use with this hydraulic unit.

Reflecting Material For Highway Markers

A new flexible fabricated reflecting material for use in highway signs and markers is made by the Minnesota Mining & Mfg. Co., St. Paul, Minn. Known as Scotchlite, this material is available in three colors, yellow, white and silver.

Reflection is achieved through a precision surface coating of special glass bead lenses especially developed in this company's research laboratories. The silver Scotchlite provides the greatest degree of reflecting power and is recommended for warning signs and markers where long-distance visibility is essential. White and yellow Scotchlite are used on traffic signs of secondary varieties, direction and informatory signs, where clear readability is the most important factor but where extreme brilliance is not important.

Scotchlite comes in rolls and is supplied with a cement coating on the reverse side. It can be applied to any type of sign surface with ease by following the simple instructions furnished by the manufacturer.

Literature describing and illustrating Scotchlite and its use for highway signs, as well as free samples of the three colors of Scotchlite, may be secured by interested state and county highway engineers direct from the manufacturer by mentioning this magazine.

New Wire Rope Handbook

The new wire rope catalog-handbook just issued by the Macwhyte Co., Kenosha, Wis., has been increased from 112 to 170 pages and contains many new additions helpful to wire rope users. More than a thousand ropes are listed and it is sectionalized for quick reference with a tabbed index and table of contents for each section. Information has been added to pages of tables, 60 pages of general information are included, and there is a glossary of every-day wire rope terms. The manufacturer states that it has long recognized the need for speed and has met this need not only in the production of wire rope but in streamlining the reference information needed to use the rope and have it give the greatest possible service.

Copies of this Catalog G-14 may be obtained by addressing your request on your company letterhead to Macwhyte Co. or this magazine.

Ziegler Machinery Opens New Building

Ziegler Machinery, Inc., Pittsburgh, Penna., announced recently the opening of its new building and display room at Noblestown Road and Mansfield Avenue, Pittsburgh. Established in 1914, this company for the past 27 years has been continuously supplying contractors, industries and agriculture with equipment and service. For 20 years this company has been the distributor for the Cleveland Tractor Co. and in addition handles Harnischfeger shovels, draglines, cranes and clamshells; Lansing concrete mixers; Multiplex concrete block machinery; La Crosse trailers; Chicago Pneumatic compressors and tools; Sterling pumps, generators, saw rigs and hoists; Owen clamshell buckets; Page dragline buckets; Sasgen derricks and winches; and Avery tractor equipment.

Handling Snow Removal In Minnesota County

(*Continued from page 2*)

there are two one-way plows for trucks, one Coleman truck and two Walter trucks with V plows and wings and twelve power graders, Austin-Western, Adams, Caterpillar and Galion, with V plows and wings, and approximately 200 miles of snow fence which is set out each year to stop drifting on the highways.

Last winter a total of 6 feet of snow fell, of which 3 feet remained on the ground throughout the winter. The Snogo rotaries have proved particularly useful in opening the highways where drifting has occurred and then are used especially to widen the roadway after the V plows have banked the snow at the sides of the road.

The Equipment Roster

The 1940 equipment roster for Stearns County, Minnesota, gives a fair idea of its activity, as all equipment is used to the full. The roster shows:

2 Walter trucks
1 Coleman truck
3 Ford V-8 1½-ton trucks
1 Dodge 1½-ton truck
2 Chevrolet suburban wagons
1 Ford pick-up truck
1 Ford dump truck
1 GMC 1½-ton truck
3 Caterpillar Sixty tractors
1 International TD-40 tractor
1 International TD-18 tractor
1 Austin-Western mucker
1 Bucyrus-Erie scraper
1 Austin-Western scraper
1 Speeder shovel
2 two-wheel heavy-duty trailers
1 calcium chloride spreader
1 International motor, Model P300
1 Centaur mower
1 John Deere mower
1 International mower
3 V-plows and wings
1 Austin-Western V plow and wing
1 Ross one-way plow
12 motor patrols with plows and wings
1 tar kettle
1 Smith 3½ hot mixer
1 portable gas tank
1 trailer-mounted gas tank
2 Snogo rotary snow plows

Line of Jackhammers Described in New Bulletin

Ingersoll-Rand Co., 11 Broadway, New York City, has recently issued a new bulletin covering its line of modern Jackhamers. It shows that "There's a Jackhamer for Every Job" by listing the applications and describing in detail each drill from the 30-pound size to the 72-pound size. The booklet is illustrated with installation views, cross-sections and individual part views, and specifications of the different Jackhamers are given.

Copies of this booklet, Form 2775, may be obtained direct from the manufacturer by mentioning CONTRACTORS AND ENGINEERS MONTHLY.

Highway Information Service Photo

Some of the official U. S. delegation to the Fourth Pan American Highway Congress in Mexico City, September 15-24. First row, left to right, E. W. James, Chief, Inter-American Regional Office, Public Roads Administration; Roy W. Crum, Director, Highway Research Board; Stephen James, Director, Pan American Highway Confederation; second row, Major B. P. Root, Highway Specialist, Public Utilities Unit, Bureau of Foreign and Domestic Commerce; and Wainwright Bridges, Clerk, U. S. House Roads Committee.

U. S. Delegation To Road Congress

The following delegates were designated by the State Department as the official representatives of the United States government at the Fourth Pan American Highway Congress held in Mexico City September 15 to 24: Hon. Josh Lee, Senator from Oklahoma, Chairman; Hon. Wilburn Cartwright, Representative from Oklahoma; Hon. Luther A. Johnson, Representative from Texas; Hon. Jesse F. Wolcott, Representative from Michigan; Edwin W. James, Chief, Inter-American Regional Office, Public Roads Administration; William F. Machold, Assistant Director, Commercial and Financial Division, Office of the Coordinator of Inter-American Affairs, Office for Emergency Management; John Van Ness Philip, Member, Pan American Highway Finance Committee; Hal G. Sours, President, American Road Builders' Association; J. S. Williamson, President, American Association of State Highway Officials.

Technical advisers to the delegation included John Abbink, President, Business Publishers' International Corp.; Wainwright Bridges, Clerk, Committee on Roads, House of Representatives; Roy W. Crum, Director, Highway Research Board; Raleigh A. Gibson, First Secretary, American Embassy, Mexico City; Stephen James, Director, Pan American Highway Confederation; B. P. Root, Highway Specialist, Public Utilities Unit, Bureau of Foreign and Domestic Commerce; and Charles M. Upham, Engineer-Director, American Road Builders' Association. Morris N. Hughes, Consul, American Consulate General, Mexico City, served as Secretary to the delegation, and Mrs. Hannia Cabrera, PRA, was Assistant Secretary.

Special emphasis was given at this Fourth Pan American Highway Congress to topics affecting the Pan American Highway which is assuming a position of commanding importance as an integral part of the hemispheric defense program. In addition to the Congress, a road machinery exhibit was also held and a number of American manufacturers had their road equipment on display for the benefit of highway engineers and officials from the other republics of the western hemisphere.

Visible Stripe Makes Night Driving Safer

The Prismo Life-Line striping material for highways is composed of numberless little spheres of glass, embedded in a tough and strong semi-plastic binder, which refract and reflect the light of the car lamps, giving it back tinged with the color of the binder material, thus furnishing a visible marking at night with no sacrifice of daytime effectiveness. In addition to center striping, this material is used for special signs along highways called Specter-Lite signs, in Prismo delineators for marking road edges and other boundaries, and in Prismo obstruction marking for barrier fences, railroad gates, culverts and backs of trucks. According to the manufacturer, Prismo Safety Corp., Huntingdon, Penna., the marking can be applied to wood, metal, concrete, or any other flat surface.

Bulletin No. 414 just issued by this company describes this material and its various applications in detail. Copies may be obtained by writing direct to the manufacturer.

Catalog on Buckets

The Hayward Co., 32-36 Dey St., New York City, states in Bulletin No. 630 released recently that there is a type and size of Hayward bucket for every kind of digging and rehandling need, suited to every type of operating machine. Illustrated and described briefly in this bulletin are the Hayward rehandling clamshell, digging clamshell, various types of orange peel buckets, the Hayward electric motor bucket, dragline buckets, grapple devices of all sorts, and an automatic take-up reel.

Copies of this general bulletin or more detailed information on the type of bucket in which you are particularly interested may be obtained direct from the manufacturer by mentioning this item.

Spray Painting Outfits

Two improved series of 4 and 6-hp portable spray-painting air-compressing outfits for the operation of two or three spray guns have just been announced by the DeVilbiss Co., 300 Phillips Ave., Toledo, Ohio. These outfits are designed for installations in state and county highway department garages and maintenance depots, as well as in contractors' shops.

Twenty assemblies are included in the two series, including skid-mounted units, rubber-tired and steel-wheel trucks, and two-wheel trailers. The 6-hp units have a Twin Disc clutch as standard equipment, permitting the starting of the engine independently of the compressor.

Some Suggestions for Roadside Development

(*Continued from page* 28)

act as a snow fence and reports satisfactory results. Such planting usually falls outside the right-of-way and arrangement must be made with the landowner for it.

Roadside Parks

Ohio is one of the states which has done considerable work in providing roadside turn-outs, parks, and stopping places. These are a very desirable convenience to the traveler, but their design must not be too elaborate or make them unduly hard or costly to maintain. The highway designer and right-of-way engineer should keep this purpose in mind and provide usable areas at points of special interest. It is easy to overdo the matter of roadside parks and stopping places, and provide such facilities in very poor locations. Sight distance should be kept in mind in selecting sites for such parks.

Alignment and Sight Distance

The highway engineer is now designing his roads with easy curves and long sight distances so that there are long tangents, free from abrupt breaks. This practice is in accord with the design principles applied by the landscape architect.

Most highway engineers are familiar with the term "road focus" as used by Jac L. Gubbels, Head of Roadside Development in Texas, and this matter should have very serious consideration in design and in roadside-development work so that nothing will shorten and interfere with sight distances which have been provided in the general alignment, but rather that roadside development work will aid in providing greater sight distances.

Lighting

Some of the highways in metropolitan and thickly populated areas now have lighting. If highway lighting is to be installed, the landscape architect or engineer and the highway engineer should work together in the placing of lighting fixtures and in planning plantings so as not to detract from the lighting.

Erosion Control

The practice now being followed in Ohio and other states of seeding and sodding all areas as a part of the general contract permits the landscape architect to produce maximum results for the money expended. In regions of natural grass growth, sod is established naturally in two or three years, provided erosion does not prevent it and the maintenance forces can be prevented from blading it away. Therefore any reasonable seeding practice should produce satisfying results.

Seeding with heavy mulching does present some problems. In their solution, the landscape architect's complete cooperation is needed. In Ohio the shoulders on all hard-surfaced roads are required to have a slope of ¾-inch per foot, and the entire shoulder surface is dropped ½ inch below the top of the pavement edge. It is highly important that shoulders be no higher or lower than this when the seeding is completed. It is necessary to get the construction engineer's cooperation in preventing the grading contractor from building the shoulders too high, and when the seed bed is being prepared and the soil on the shoulder fluffs, the shoulder must be lowered to proper grade before seeding.

It has been necessary in a few instances in Ohio to blade newly seeded and mulched shoulders down to the grade of the pavement. This happens most often when shoulders are seeded late in the year. Sometimes it is possible to correct this by rolling. Where blading is required, the seeding on the shoulder is destroyed and it is necessary again to seed and mulch. Such difficulties arise principally on gravel, gravel-stabilized and waterbound-macadam roads.

Maintenance

The practice of dragging or blading shoulders is one which has been carelessly done and has produced many miles of badly eroded shoulders rather than improving their condition. With narrower pavements, such as the 16 and 18-foot widths and on roads of 20-foot widths carrying a large volume of traffic, it is often desirable to have a graveled shoulder. But the useful and needed width of gravel is limited to 2 or 3 feet and there can be no instance in which it is necessary or desirable to blade the outer grassed portion of the shoulder.

In maintenance work, we should strive to establish grass on all shoulder areas not used or disturbed by traffic. The narrow shoulder drag used in Ohio for placing a strip of gravel or crushed stone along the edge of the pavement is a most excellent shoulder-maintenance practice. But all maintenance men will concede that the cost of mowing is considerably less than the cost of shoulder blading. It might be well to point out here to the landscape architect that he should consider the cost of mowing, in planning his planting, so that substantially all of the grassed areas can be reached by a tractor-driven mower.

A general spring rolling of all shoulder areas is recommended. After the frost has gone, these areas are loosened and raised. A medium-weight roller, such as can be pulled by a truck, will pack and lower the shoulder, thereby reducing the possibility of having to blade off sod.

Roadside Planting

It is suggested that in developing landscape plans for important road intersections or for any areas where there may be merging or crossing traffic, the landscape architect should consult with both the designing engineers and the traffic division of his highway department. Highway engineers have learned much in the last few years about the arrangement of intersections and the use of channelization. Plantings can improve conditions or can make them worse. Cooperative study of specific problems results in an improvement in the work of both the engineer and the landscape architect.

The early plans for roadside improvement were developed by men familiar with city, residential, park and other types of planting requiring the treatment of relatively small areas that would be maintained as concentrated improvements. The first roadside improvement done with Federal Aid was adjacent to cities and often joined city planting, so that the general tendency was toward over-planting. Granting that there should be a transition between city and rural planting, many highway plantings have too many trees and shrubs. Often the road has native growth on each side, so that the highway area needs only occasional treatment to be attractive and safe. More attention should be given to the selection of planting locations and there should be fewer units of planting.

Excellent results have been produced in the cooperative efforts of landscape architects and highway engineers in planning and building highways. Greater cooperation will aid still further in solving the common problems of their task of building a better and greater highway system.

From a paper presented before the First Annual Roadside Development Conference, Ohio State University, 1941.

The new Studebaker hydraulic vise.

New Hydraulic Vise Speeds Up Shop Work

A new hydraulic vise, designed to speed up small press and cutting operations as well as for ordinary vise work in shops and garages, has recently been announced by the Studebaker Machine Co., 9 So. Clinton St., Chicago, Ill. Capable of developing pressures up to 5 tons between the jaws, the new vise is operated entirely by foot control, permitting the use of both hands in handling work. The unit is self-sufficient, no outside power being needed.

Pressure to close the jaws is controlled by a foot pedal arrangement in a pedestal mounted on the floor which is connected with the vise proper by a steel tube which carries the hydraulic fluid to a ram behind the back jaw and thus moves it forward. The front jaw is stationary. Stepping on one pedal moves the vise jaw against the work; a second pedal applies pressure up to 5 tons; and a third pedal releases the jaw. The vise mounts horizontally on any type of bench as well as vertically on wall or post. In addition, it can be mounted on a portable stand, as a movable self-contained work, and thus can be moved about the shop as required. Two sizes are available, a 5-inch width between jaws and a 7½-inch width.

Among the various types of work performed by this Studebaker hydraulic vise are press work, punching, bending, cutting, straightening, testing and stamping. Because the operator can use both hands, it is reported that exceptionally heavy work can be handled easily and with great precision.

A new bulletin with complete information on this vise may be secured by contractors and state and county highway engineers direct from the manufacturer by mentioning this magazine.

34-E Single-Drum Paver Described in New Catalog

Recent improvements in the Ransome 34-E single-drum paver are fully illustrated and described in an 8-page 2-color bulletin published by the Ransome Concrete Machinery Co., Dunellen, New Jersey. According to the manufacturer, the fully hydraulically-controlled boom swing, discharge chute and water valve remain the outstanding features of this paver. These features are headlined, illustrated and fully explained, specifications are given, and there are line drawings showing principal dimensions and power transmission arrangement.

Copies of this bulletin, No. 179, may be obtained from the manufacturer.

Improved Control Box For Electric Welder

Further improvement in dual continuous control for arc welding machines has been announced by the Lincoln Electric Co., Cleveland, Ohio, in the form of a new welder control box. This new box, designated as Type G, prevents accidental contact with live parts, increases accessibility, permits wiring with flexible or rigid conduit or rubber-covered multiple-conductor cable, and eliminates dangers from unintentional loosening of the lifting hook, according to the manufacturer.

One of the features of this new box is the fact that there is a separate compartment for all a-c circuits, including push button, and another separate one for d-c terminals. Another feature of the Type G is the improved design and construction of the lifting hook which eliminates all risk of the hook being unscrewed by accident and becoming a hazard. Special non-shorting lugs prevent the possibility of blowing up the input lines due to shorted input lugs because of careless maintenance. An additional feature is a new lead clamp which prevents the bending or damage to output studs when the welder leads are accidentally jerked or pulled.

Further information on this new Type G control box may be secured by interested contractors and engineers direct from the manufacturer by mentioning this item.

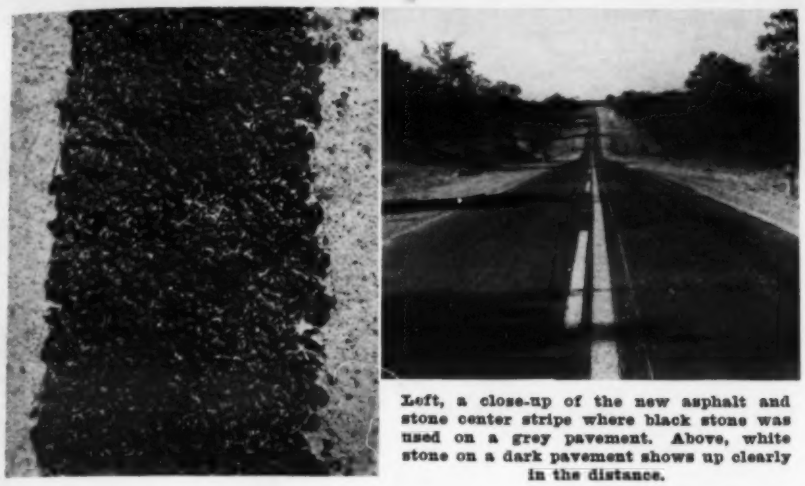
Protective Coating For Sheet Metals

For many years The Philip Carey Mfg. Co., of Cincinnati, Ohio, has produced a coating for metal used by industrial and transportation organizations for rust and weatherproofing. Made from virtually this same specification, Carey also produces a roof coating marketed under the trade name of Careyclad, which has been used with success for coating black-iron sheets, structural steel, metal buildings, bridges, heavy machinery, ornamental iron work, and duct work.

The Research Division of Carey reports that its extensive tests in the field and in the laboratory show that Careyclad "is not only equal to red lead coatings and lead coatings pigmented with carbon black, but in many cases it is superior". Of interest at the present time is its coverage, approximately 1 gallon per square of smooth metal surface, its steady price, and its ample supply. The manufacturer reports that prompt shipment of this metal coating can be made so that its use will release some of the important priority materials for defense purposes.

Careyclad Coating, which includes a relatively high percentage of asbestos fibre, is rather highly abrasion-resistant and is resistant to all three of the most commonly prevailing adverse atmospheric conditions: acid, alkaline, and salt. It is also highly resistant in direct contact with weak acid, weak alkali and salt solutions. It may be applied by either spray painting, brushing or dipping at everyday indoor or outdoor temperatures. The only distinction is between winter and summer grade.

Complete information and prices may be secured direct from The Philip Carey Mfg. Co., 8 Wayne Ave., Lockland, Cincinnati, Ohio.



Left, a close-up of the new asphalt and stone center stripe where black stone was used on a grey pavement. Above, white stone on a dark pavement shows up clearly in the distance.

New Type of Stripe Used on Texas Roads

(*Continued from page* 32)

laying it. This consists of a small four-wheeled chassis on which is mounted a large tank and pump for spraying the asphalt stripe, a regular Highway Department maintenance dump truck carrying the small stone, a spreader, and a roller to press the stone into the stripe. The truck pushes the striper and the small stone flows from the elevated dump body of the truck into the spreader immediately back of the truck and in front of the roller. The truck pulls both the spreader and the roller besides pushing the striper. This outfit can lay about 4 miles of completed stripe an hour, at a cost of about $17 a mile.

Test stripes are being tried out on highways in various sections of the state, with yellow, white and other colored paint sprayed onto and between the small rock in the new stripe. Experiments to color the white stone with chemicals before it is placed are under way.

Features of New Stripe

On heavily traveled highways, painted or plain asphalt stripes wear off usually within a period of months, necessitating frequent replacement. Since this semi-permanent stripe outwears the painted or plain asphalt stripe, it is expected that it will ultimately bring about a substantial reduction in expenditures for center striping throughout the state.

Since the built-up thickness of this new type of stripe raises it slightly above the pavement surface, it can be seen more readily when the light is so intense that the sense of color is impaired. This is notably true when headlight glare is encountered on a wet pavement at night. The stripe protrudes above the film of water on the pavement and is highly visible. As the surface texture of the stripe is made to contrast with that of the pavement, this also contributes to visibility under extreme conditions of glare.

Because of its greater visibility and also because it can be felt slightly when the front tires touch it, the new stripe is effective in keeping traffic separated and on the right side of the road, and therefore should reduce collisions.

Another advantage of the new stripe is that cars may run over it almost as soon as it is put down, without smearing it, which is particularly important on heavily traveled highways.

New Permanent Stripe

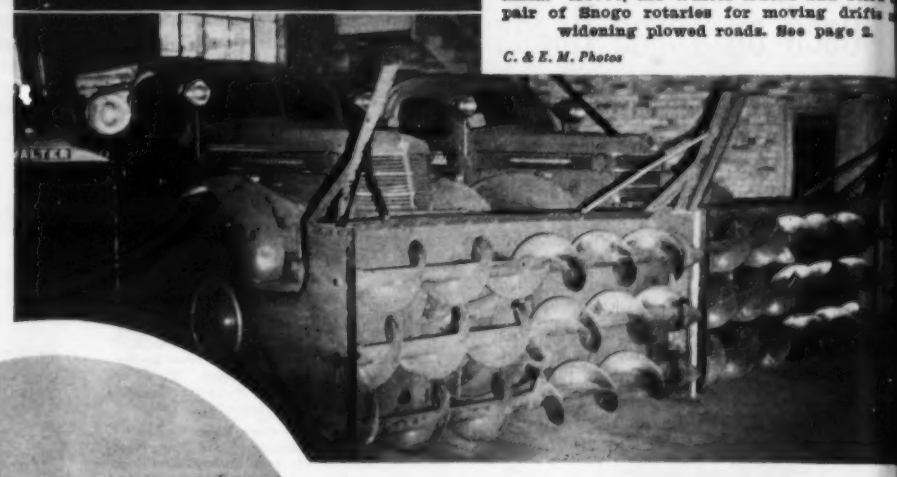
The Texas Highway Department also has devised a new permanent center stripe for concrete highways and a considerable amount of it has been built into new concrete paving. Two engineers of the Department developed the idea of mixing a black or other colored stripe into the concrete pavement as the road is constructed, doing away with the added necessity and expense of painting or spreading on a stripe. This new method will save more than $700,000 in the next 20 years, according to estimates of the Texas Highway Department.

An example of the use of a permanent center stripe occurs on the Galveston Causeway (C. & E. M., Sept., 1939, page 2) where a 6-inch black center stripe was l ilt into the roadway by working magnetic oxide into the fresh concrete by means of a wood float operated between a pair of wood planks placed in position as soon as the concrete had set sufficiently for a man to get on it.

Index to Advertising

Contractors and Engineers Monthly

A Koehring Dumptor receiving a one-rock load for the rock fill from a 37-B Bucyrus-Erie at Surry Mountain Dam. See page 17.



Snow removal units used by Stearns Co[unty], Minn. Above, the Walter trucks and below [a] pair of Snogo rotaries for moving drifts [and] widening plowed roads. See page 2.

C. & E. M. Photos

At left, Charles deBiasi, Superintendent of Concrete Construction, and Temple Rutherford, General Superintendent for A. I. Savin Construction Co. at Surry Mountain Dam.

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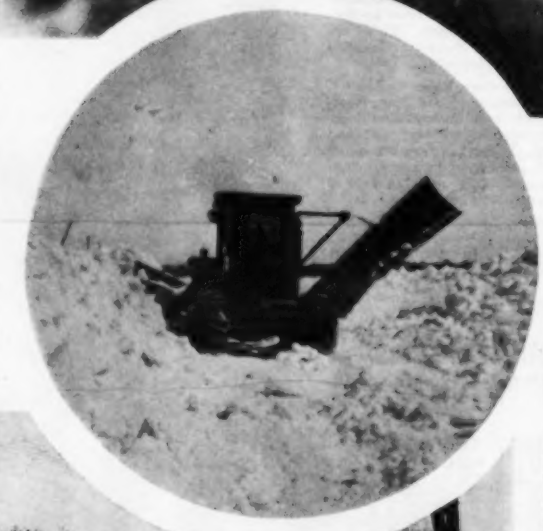
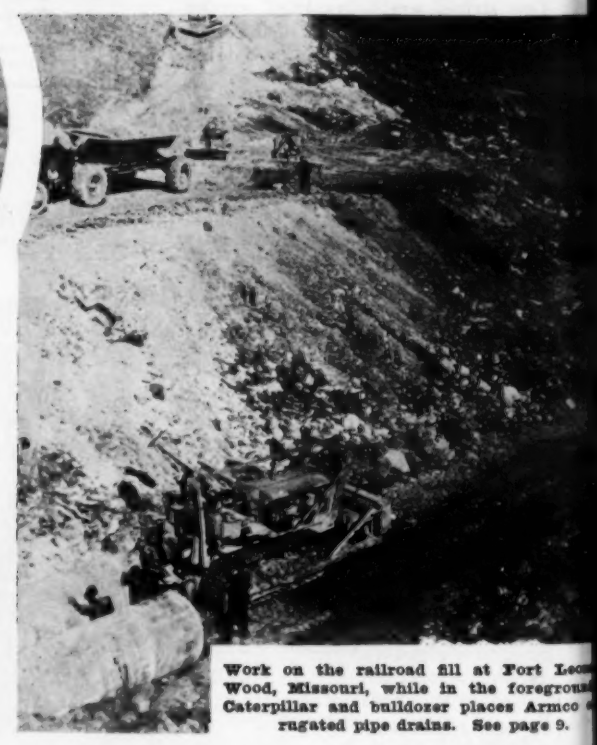
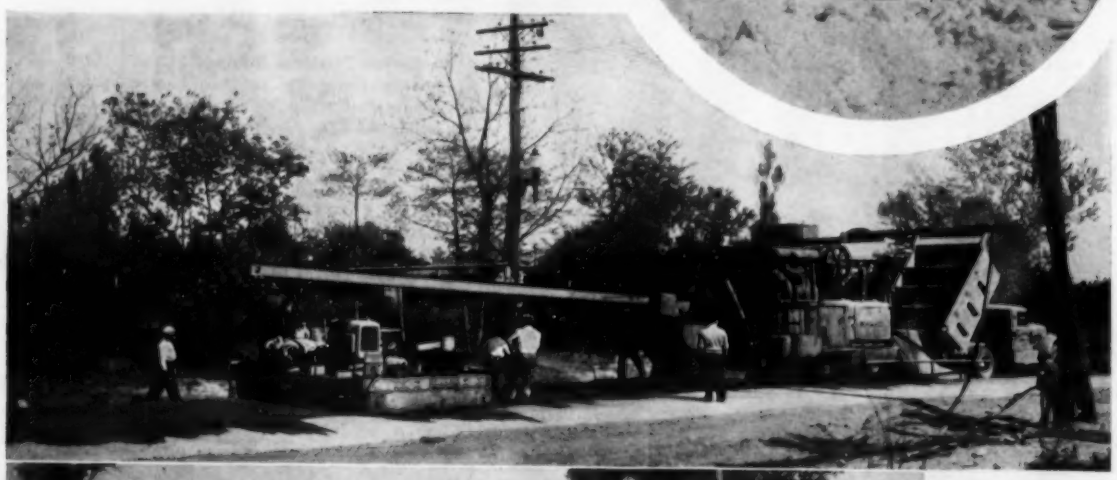
A power grader with plow and wings clearing snow in Stearns County, Minn., after the St. Patrick's Day blizzard, 1941, at right. See page 2.



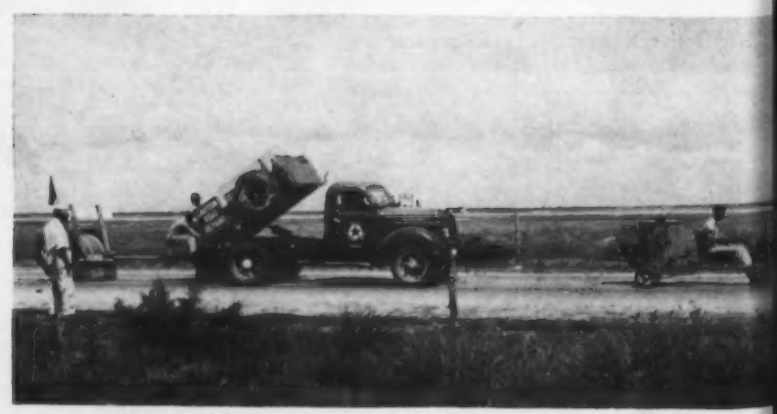


Work on the railroad fill at Fort Leo[nard] Wood, Missouri, while in the foregrou[nd] Caterpillar and bulldozer places Armco [corru]gated pipe drains. See page 9.



C. & E. M. Photos

Four-batch trucks had a 12-mile round trip to keep the fast 34-E paver operating on the M. A. Gammino West Shore Road contract in Conimicut, R.I. Lower photo, a readily portable derrick with a Sasgen hand winch set the precast concrete curb on the West Shore Road. See page 7.



The center-striping outfit used by the Texas Highway Department in operation near Corpus Christi. The aggregate truck provides the motive power for the entire outfit. With this equipment, Texas has laid many miles of its new type of asphalt-and-stone-mix center stripe which is said to be particularly visible. See page 32.